

Evaluation of the Mwangaza Mashinani pilot project in Kilifi and Garissa counties, Kenya

Volume II: Baseline technical annexes

Evaluation period: 2019 - 2021

Evaluation location: Kenya



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ACRONYMS

ARI	Acute Respiratory Infection
ATE	Average Treatment Effect
BCC	Behaviour Change Communication
BWC	Beneficiary Welfare Committee
CC	Community Champion
CCTP	Consolidated Cash Transfer Programme
CT-OVC	Cash Transfer for Orphans and Vulnerable Children
DID	Difference-in-differences
E4I	Energy for Impact
FPC	Finite Population Correction
FSU	Final Sampling Unit
GoK	Government of Kenya
IGA	Income Generating Activity
ITT	Intention-to-treat
MIS	Management Information System
MTF	Multi-tier framework
NN	Nearest Neighbour
NSNP	National Safety Net Programme
OP-CT	Older Persons' Cash Transfer
OPM	Oxford Policy Management
PCA	Principal Component Analysis
PAYG	Pay-as-you-go
PSM	Propensity Score Matching

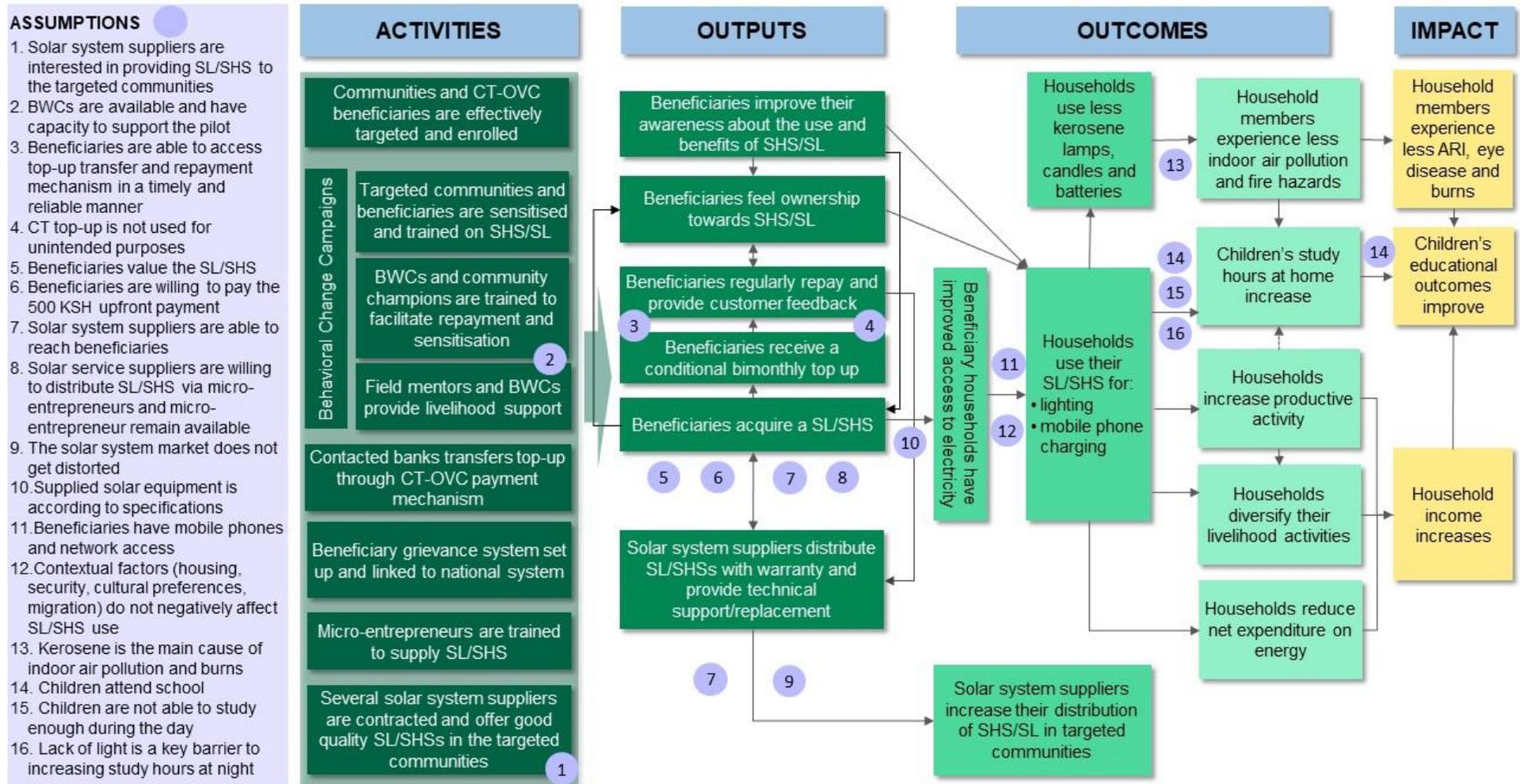
PSU	Primary Sampling Unit
PWSD-CT	Cash Transfer for Persons With Severe Disabilities
RCT	Randomised Control Trial
RGA	Research Guide Africa
SAU	Social Assistance Unit
SIDA	Swedish International Development Agency
SHS	Solar Home System
SL	Solar Lantern
SRS	Simple Random Sampling
TOC	Theory of Change
TOR	Terms of Reference
UNDSS	United Nations Department of Safety and Security
UNICEF	United Nations Children's Fund

INTRODUCTION

Oxford Policy Management (OPM) has been contracted by UNICEF to conduct an independent evaluation of the Mwangaza Mashinani pilot project. This baseline report presents the findings from the quantitative baseline survey as part of a one-year mixed methods evaluation, which will combine baseline and endline quantitative household surveys with endline qualitative research. This report is presented in two volumes. Volume I presents the baseline findings and discussion and Volume II contains the technical annexes to the baseline report.

Volume II is structured as follows: Annex A presents the Theory of Change graphically. Annex B presents the evaluation matrix including key evaluation questions, detailed evaluation questions and the sources of evidence that will be used to answer these questions at endline. Annex C provides technical details on the sampling strategy. Annex D provides detail on the survey design and implementation. Annex E presents the statistical tables for the treatment group for all indicators reported in Volume I and contained in the evaluation matrix across all disaggregations. Annex F provides technical detail on the propensity score matching approach as well as comprehensive balance diagnostics across all impact areas of interest. Annex G provides technical details on calculating energy access using the multi-tier framework approach. Finally, Annex H presents the statistical tables for the comparison group for all indicators in the evaluation matrix across all disaggregations.

ANNEX A THEORY OF CHANGE



ANNEX B EVALUATION MATRIX

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
Relevance				
KEQ1. How well is the pilot project suited to the needs of the target population, their community and private sector SL/SHS suppliers?				
DEQ 1.1. Is the pilot project's objective of improving access to off-grid SHS and SL relevant to the target population's energy and welfare (education, health and livelihood) needs?	<ul style="list-style-type: none"> The market penetration of SL and SHS in targeted communities was limited at the start of the pilot 	<ul style="list-style-type: none"> Prevalence of SHS and SL in sample population's homes in control or target groups at baseline Distribution of SL/SHSs and PAYG mechanisms in local markets as perceived by suppliers 	Quantitative survey Key informant interviews (suppliers, last mile distributors)	Baseline Endline
	<ul style="list-style-type: none"> Affordability and cash constraints are the main barriers to the target population's acquisition of off-grid SHS and SLs 	<ul style="list-style-type: none"> Reasons for not having a solar device Take up of SHS / SL options amongst target population, compared to comparison population, once cash transfer plus option introduced 	Quantitative survey Routine monitoring data	Baseline Endline
	<ul style="list-style-type: none"> SL/SHS are suited to address the target population's energy needs, particularly related to education, health and productive activity 	<ul style="list-style-type: none"> Children's school attendance Children's study hours Prevalence of respiratory diseases and burns Number of hours spent on productive activities including during darkness hours Beneficiaries' perception of relevance of SHS and SL 	Quantitative survey Household and community qualitative research	Baseline Endline
DEQ1.2. Is the intervention approach acceptable to the target population, their community and private SHS/SL suppliers?	<ul style="list-style-type: none"> The target population perceive the acquisition of SL/SHS through the contracted suppliers, the down-payment and repayment following cash top-ups as acceptable 	<ul style="list-style-type: none"> Affordability of down-payment as perceived by the target population Frequency and reliability of cash top-ups in relation to the PAYG repayment schedule Availability of last mile distributors Target population's trust in last mile distributors 	Routine monitoring data Household and community qualitative research	Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
	<ul style="list-style-type: none"> Community leaders and other representatives perceive the intervention as well targeted and beneficial to the community SL/SHS suppliers are interested in providing SL/SHS to the entire target population according to the planned intervention specifications 	<ul style="list-style-type: none"> Acceptability of mechanism for both receiving cash top-up and making PAYG repayments In the view of community leaders: <ul style="list-style-type: none"> Perception of who is being targeting Knowledge and perceptions of targeting criteria Reason why some households did not take up the project Perception of SL / SHS systems provided to households Suppliers interest in continuing / engaging in supply Suppliers plans to continue to supply the target population 	<ul style="list-style-type: none"> Quantitative survey Routine monitoring data Household and community qualitative research Key informant interviews (contracted suppliers, suppliers not contracted) 	<ul style="list-style-type: none"> Endline Endline
KEQ2. Is the pilot project ToC internally and externally coherent?				
DEQ2.1. Is the pilot project's ToC valid, comprehensive and commonly understood by the main stakeholders?	<ul style="list-style-type: none"> Key ToC assumptions are likely to hold true and pathways are plausible 	<ul style="list-style-type: none"> Evidence that key assumptions are holding true at outset of project, namely: <ul style="list-style-type: none"> competition results in supplier being contracted (assumption 1) beneficiaries demonstrate demand by making 500Khs deposit (assumption 6) beneficiaries can access cash top-up in a timely manner to make repayments (assumption 3) SHS/SL suppliers are able to reach beneficiaries (assumption 7) beneficiaries have mobile phones (assumption 11) Children attend school and would study more if light were available after dark (assumptions 14,15 and 16) 	<ul style="list-style-type: none"> Routine monitoring data Quantitative survey Household and community qualitative research Literature review 	<ul style="list-style-type: none"> Inception Baseline Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
		<ul style="list-style-type: none"> ○ cooking occurs outdoors or in separate building (making kerosene lighting more likely to be the most significant source of indoor air pollution) (assumption 13) - Evidence that key assumptions hold at endline: <ul style="list-style-type: none"> ○ solar equipment supplied matches required specifications (assumption 10) - Literature review findings on pathways to impacts on health education and productive use for SHS and SLs. 		
	<ul style="list-style-type: none"> • The objectives of enhancing access to energy to the most vulnerable segment of the population and increasing market penetration in vulnerable communities can plausibly be achieved through the intervention approach 	<ul style="list-style-type: none"> - Reasons for not joining the project - Specifications of solar equipment supplied - Number of household members - Number of rooms in household 	Routine monitoring data Quantitative survey Household and community qualitative research Key informant interviews (implementing partner, community leaders) Documentation review	Baseline Endline
	<ul style="list-style-type: none"> • Key programme stakeholders commonly understand the objectives and intervention approach 	<ul style="list-style-type: none"> - Stakeholder understanding of the pilot project's target population - Stakeholder understanding of level of impact expected on target population - Stakeholder understanding of methodological approach to extending PAYG market delivery mechanism 	Key informant interviews	Endline
DEQ2.2. Are the pilot project's objectives and approach aligned with government policies?	<ul style="list-style-type: none"> • The pilot project is aligned with government's energy policies 	<ul style="list-style-type: none"> - Degree of alignment with the Kenya Rural Electrification Authority's own off grid solar access project (K-OSAP) in terms of approach or counties selected - Specifications of SL and SHS supplied in relation to Kenya standards 	Key informant interviews (REA) Documentation review	Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
	<ul style="list-style-type: none"> The pilot project is aligned with government's social protection policies 	<ul style="list-style-type: none"> Alignment with the NSNP's targeting procedures 	<ul style="list-style-type: none"> Key informant interviews (SPS, SAU) Documentation review 	Endline
	<ul style="list-style-type: none"> The pilot project is aligned with the development plans of the targeted counties 	<ul style="list-style-type: none"> Alignment with plans for rural electrification as perceived by local county planners 	<ul style="list-style-type: none"> Key informant interviews (county authorities) 	Endline
Effectiveness				
KEQ3. To what extent have beneficiary households improved their awareness about and feel a sense of ownership towards their SL/SHS?				
DEQ3.1. To what extent have beneficiary households improved their awareness about the use and benefits of SL/SHS?	<ul style="list-style-type: none"> Increased awareness of existence and application of solar systems 	<ul style="list-style-type: none"> Proportion of households without a solar system that are aware of solar systems Households awareness of systems and their benefits Households use of solar system 	<ul style="list-style-type: none"> Quantitative survey Household and community qualitative research 	<ul style="list-style-type: none"> Baseline Endline
	<ul style="list-style-type: none"> Increased knowledge of potential benefits of solar systems for household members' quality of life and welfare 	<ul style="list-style-type: none"> Proportion of households aware of at least one benefit of solar systems Proportion of households aware of more than one benefit of solar systems 	<ul style="list-style-type: none"> Quantitative survey Household and community qualitative research 	<ul style="list-style-type: none"> Baseline Endline
	<ul style="list-style-type: none"> Increased awareness and knowledge of solar systems within the community 	<ul style="list-style-type: none"> Proportion of households that have been approached by BWC members or community champions to discuss use and benefits of solar systems Proportion of households that have discussed use and benefits of solar systems with other households in the community Community leaders understanding of the application of solar systems and their use Community leaders understanding of the benefits of solar systems at the community level 	<ul style="list-style-type: none"> Quantitative survey Household and community qualitative research 	<ul style="list-style-type: none"> Endline
KEQ3.2. To what extent do beneficiary	<ul style="list-style-type: none"> Willingness to own a solar system 	<ul style="list-style-type: none"> Number of households willing to pay deposit for a solar system 	<ul style="list-style-type: none"> Quantitative survey 	<ul style="list-style-type: none"> Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
households feel a sense of ownership towards their SL/SHS?		<ul style="list-style-type: none"> - Average monetary value attached by households to the solar systems - Proportion of households without a solar system that would like a solar system 	Household and community qualitative research Routine monitoring data	
	<ul style="list-style-type: none"> • Regular use and payment for solar systems 	<ul style="list-style-type: none"> - Proportion of households that have repaid the solar systems, including repayment schedule and overall repayment - Proportion of households that have been using solar systems for income-generating activities, studying and other unexpected purposes - Households' perception of the value in paying/identifying ways to pay for solar systems beyond the end of the pilot project 	Routine monitoring data Quantitative survey Household and community qualitative research	Endline
	<ul style="list-style-type: none"> • Regular maintenance of solar systems 	<ul style="list-style-type: none"> - Proportion of households whose solar systems are not working - Proportion of households who have taken their solar system to be repaired - Proportion of households who have paid to repair their solar systems - Households' perception of the value and benefits of the solar systems - Households' willingness to keep systems functioning 	Quantitative survey Household and community qualitative research	Endline
KEQ4. How effectively have the operational modalities been taken up by the targeted beneficiaries and private sector suppliers? What are lessons for scale-up and replication in the NSNP?				
DEQ4.1. How well was the pilot project able to generate take up of the SL and SHS among the target population?	<ul style="list-style-type: none"> • The pilot project is able to enrol the target population as planned 	<ul style="list-style-type: none"> - Number of target population enrolled, by gender and location - Proportion of targeted population that accept enrolment and take up of a SL or SHS - Proportion of enrolled beneficiaries that satisfy the beneficiary targeting criteria - Proportion of selected/enrolled beneficiaries that pay the initial down-payment as planned 	Routine monitoring data Quantitative survey Household and community qualitative research Key informant interviews (implementing partner)	Quarterly Baseline Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
	<ul style="list-style-type: none"> The enrolled beneficiaries are able to choose between SL and SHS, and take up the SL or SHS 	<ul style="list-style-type: none"> Lessons learnt about enrolment process Proportion of enrolled beneficiary HHs that choose a SL or SHS Proportion of enrolled beneficiary HHs that received a SL or SHS (compared to planned) Proportion of enrolled beneficiary that made use of warranty or after sales service Proportion of enrolled beneficiary HHs that have two functioning SLs or one functioning installed SHS at the end of the pilot Information received by the enrolled beneficiary to make an informed choice Lessons learnt about supply and demand of SL versus SHS and after sales services 	<ul style="list-style-type: none"> Routine monitoring data Quantitative survey Household and community qualitative research Key informant interviews (implementing partner, suppliers) 	Endline
	<ul style="list-style-type: none"> The enrolled beneficiaries that are satisfied with the SL or SHS delivered 	<ul style="list-style-type: none"> Households' satisfaction with delivery system of the SL/SHS Households' satisfaction with the SL and SHS products 	<ul style="list-style-type: none"> Household and community qualitative research 	Endline
DEQ4.2. To what extent did beneficiary household take up the bi-monthly top-up and payment modality?	<ul style="list-style-type: none"> The cash top-ups were paid and received according to plan and conditionality 	<ul style="list-style-type: none"> Proportion of beneficiaries that are paid the top-up amount on a bi-monthly basis Proportion of beneficiaries that do not comply with conditionality whose payment is stopped Proportion of beneficiaries that accessed the last bi-monthly payment Beneficiaries' understanding and experience with top-up payments Lessons learnt about top-up payment modality 	<ul style="list-style-type: none"> Routine monitoring data Quantitative survey Household and community qualitative research Key informant interviews (implementing partner, SAU, UNICEF) 	Endline
	<ul style="list-style-type: none"> The enrolled beneficiaries repay the price of the SL and SHS 	<ul style="list-style-type: none"> Proportion of beneficiaries that complete repayment Proportion of repayments to suppliers that have been delayed by x days 	<ul style="list-style-type: none"> Routine monitoring data Quantitative survey Household and community qualitative research 	Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
		<ul style="list-style-type: none"> - Average length of payment delays - Beneficiaries' understanding and acceptance of the repayment modality - Households' perception of feasibility of repayment mechanisms - Barriers to or reasons for delayed or non-repayment - BWCs and community champions follow ups with households - Lessons learnt about repayment modalities 	Key informant interviews (implementing partner, suppliers, UNICEF)	
DEQ4.3. How well were the SL/SHS suppliers able to distribute the SL/SHS among the enrolled beneficiaries and other community members?	<ul style="list-style-type: none"> • The suppliers set up a supply chain to deliver the SL/SHS and after sales services in the targeted communities 	<ul style="list-style-type: none"> - Location of point of sales and after sales services by supplier - Number of trained micro-entrepreneurs/last mile distributors - Extent o after sales services provided by suppliers in targeted communities - Lessons learnt in the creation of a supply chain 	Key informant interviews (implementing partner, suppliers, UNICEF, energy experts)	Endline
	<ul style="list-style-type: none"> • The suppliers supply SL and SHS to the beneficiaries according to MoU specifications 	<ul style="list-style-type: none"> - Specifications of SL and SHS received by beneficiary households - Date of delivery of SL and SHS to beneficiary households - Barriers to supplying the specified SL/SHS to the enrolled beneficiaries - Lessons learnt about the feasibility of supplying the SL/SHS according to MoU specifications 	Routine monitoring data Household and community qualitative research Key informant interviews (implementing partners, suppliers, UNICEF, energy experts)	Endline
	<ul style="list-style-type: none"> • The suppliers expand their supply SL and SHS in the targeted communities beyond the beneficiaries 	<ul style="list-style-type: none"> - Sales of specified SL and SHS in the targeted communities - Sales of other energy products in the targeted communities - Barriers to expanded distributions of SL/SHS in the targeted communities 	Routine monitoring data Household and community qualitative research Key informant interviews (implementing partners, suppliers, UNICEF, energy experts)	Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
		- Lessons learn about expanded distribution of SL/SHS in the targeted communities		
Impact				
KEQ5. To what extent did the pilot project have an attributable significant impact on beneficiary households' access to energy and use of the SL/SHS for energy services?				
DEQ5.1. To what extent did the pilot project have an attributable significant impact on beneficiary households' access to energy?	<ul style="list-style-type: none"> Increase in household level energy access between Tier 0 and Tier 1 energy? 	<ul style="list-style-type: none"> Proportion of households falling into tier 0 and tier one using the multi-tier measurement of energy access (capacity and availability of supply) Number of people who are served with a tier 1 level of energy access (equivalent to a lighting system that provides 1000 lumen hours of light for a household of 5 persons) 	Quantitative Survey	Baseline Endline
	<ul style="list-style-type: none"> Increase in number of energy sources used by the household 	<ul style="list-style-type: none"> Proportion of households with access to mini grid and/or national grid Proportion of households owning a SHS and/or a SL 	Quantitative Survey	Baseline Endline
DEQ5.2. To what extent did the pilot project have an attributable significant impact on beneficiary households' use of SL/SHS for energy services?	<ul style="list-style-type: none"> Beneficiary households use own SL/SHS for lighting 	<ul style="list-style-type: none"> Sources of energy used for lighting Proportion of households using SHS and/or SL for lighting Average hours solar system is used for lighting each day Households recognise the benefits of possessing and using the SL/SHS for lighting 	Quantitative Survey Household and community qualitative research	Baseline Endline
	<ul style="list-style-type: none"> Beneficiary households use own SL/SHS for mobile phone charging 	<ul style="list-style-type: none"> Proportion of households using SHS and/or SL for charging their household's mobile phone Proportion of households using SHS and/or SL for charging other household's mobile phone 	Quantitative Survey Household and community qualitative research	Baseline Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
	<ul style="list-style-type: none"> Beneficiary households use own SL/SHS for productive activities and/or study time 	<ul style="list-style-type: none"> Proportion of households using SHS and/or SL for charging other household's mobile phone for a fee Households' perceptions of the benefits of possessing and using the SL/SHS for mobile phone charging Proportion of households using SHS and/or SL for charging other household's mobile phone for a fee Proportion of households using SHS and SL for productive purposes Proportion of women using SHS and SL for productive or social purposes Proportion of children using SHS and SL for studying Households' perceptions of the benefits of possessing and using the SL/SHS for productive activities and/or study time 	Quantitative Survey Household and community qualitative research	Endline
	<ul style="list-style-type: none"> Beneficiary households use less kerosene lamps, candles and batteries 	<ul style="list-style-type: none"> Number of kerosene lamps in use in household Number of candles used in the household each month Number of batteries used in the household month Households' perceptions of the benefits of possessing and using the SL/SHS to replace the use of kerosene lamps, candles and batteries 	Quantitative Survey Household and community qualitative research	Baseline Endline
KEQ6. To what extent and how did the pilot project have an attributable significant impact on the quality of life of beneficiary households, especially children?				
DEQ6.1. To what extent and how did the pilot project have an attributable significant impact on the education	<ul style="list-style-type: none"> Girls' and boys' study hours at home increase 	<ul style="list-style-type: none"> Children's time spent (in hours on a typical day): studying at home (in daylight) Children's time spent (in hours on a typical day): studying at home (during darkness using lighting) 	Quantitative Survey Household and community qualitative research	Baseline Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
of children, girls and boys, in beneficiary households?		<ul style="list-style-type: none"> - Proportion of children doing homework outside of school - Households' perception of changes in children's hours of study (with an increase in studying during dark hours) since the installation of SL/SHS - Community's perception of change in study hours of school aged children since the rollout of the pilot project 		
	<ul style="list-style-type: none"> • Girls' and boys' school attendance increases 	<ul style="list-style-type: none"> - Proportion of children attending school - Proportion of children regularly attending school - Households' perception of changes in school attendance since the installation of SL/SHS - Community's perception of change in school attendance of school aged children since the rollout of the pilot project 	Quantitative Survey Household and community qualitative research	Baseline Endline
	<ul style="list-style-type: none"> • Girls and boys are promoted to the following grade 	<ul style="list-style-type: none"> - Proportion of children graduating to their next grade 	Quantitative Survey	Endline
	<ul style="list-style-type: none"> • Girls' and boys' average grades improve 	<ul style="list-style-type: none"> - Average score (out of 100) of primary school children in: English, Maths, Swahili, Social Studies, Science - Households' perception of changes in children's school performance 	Quantitative Survey Household and community qualitative research	Baseline Endline
DEQ6.2. To what extent did the pilot project have an attributable significant impact on the household members' health in beneficiary households?	<ul style="list-style-type: none"> • Household members report fewer symptoms of respiratory illness due to indoor air pollution 	<ul style="list-style-type: none"> - Proportion of household members reporting symptoms of acute respiratory infections (ARI) - Proportion of households burning kerosene inside the home - Proportion of households cooking indoors - Type of cooking fuel used by household 	Quantitative Survey Household and community qualitative research	Baseline Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
		<ul style="list-style-type: none"> - Households' perception of changes in their respiratory health - Community's perception of changes in health since the rollout of the pilot project 		
	<ul style="list-style-type: none"> • Household members report fewer symptoms of ocular disease due to indoor air pollution 	<ul style="list-style-type: none"> - Proportion of school going children reporting symptoms of eye irritation - Households' perception of changes in their ocular health - Community's perception of changes in ocular health since the rollout of the pilot project 	Quantitative Survey Household and community qualitative research	Baseline Endline
	<ul style="list-style-type: none"> • Household members report fewer incidences of burns due to lighting fuel fire hazards 	<ul style="list-style-type: none"> - Proportion of household members reporting burns related to lighting fuel in past six months - Households' perception of risk of burning due to kerosene - Community's perception of changes in risk of burns from kerosene since the rollout of the pilot project 	Quantitative Survey Household and community qualitative research	Baseline Endline
DEQ6.3. To what extent and how did the pilot project have an attributable significant impact on beneficiary household income by increasing men and women's livelihood opportunities and reducing household energy expenditure?	<ul style="list-style-type: none"> • Increase in number and type of income-generating activities for household 	<ul style="list-style-type: none"> - Proportion of household members engaged in income-generating activities - Number of new income-generating activities started in the past 12 months (including enterprises promoted by project's engagement strategy) - Household's perception of change in the type and number of income-generating activities available to and used by them - Community's perception change increase in number and type of income-generating activities community members are engaged in 	Quantitative Survey Household and community qualitative research	Baseline Endline
	<ul style="list-style-type: none"> • Increase in engaging in income-generating activities during darkness hours 	<ul style="list-style-type: none"> - Proportion of household members engaged in income generating activities undertaken during darkness hours 	Quantitative Survey	Baseline Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
		<ul style="list-style-type: none"> - Hours spent on income generating activities undertaken during darkness hours - Households' perception of change in the type and number of income-generating activities during darkness available to and used by them - Community's perception of change of available and accessible income-generating activities during darkness community members are engaged in 	Household and community qualitative research	
	<ul style="list-style-type: none"> • Increase in hours spent on income generating activities 	<ul style="list-style-type: none"> - Number of hours worked in the last one week (for working household members) - Women's time spent (in hours on a typical day): paid labour - Women's time spent (in hours on a typical day): unpaid labour - Households' perception of changes in time use with increases in time spent by women on income-generating activities - Households' perception of changes in time spent by members, in particular women, on income-generating activities as having a positive or negative effect on their general welfare 	Quantitative Survey	Baseline Endline
	<ul style="list-style-type: none"> • Increase in total household income 	<ul style="list-style-type: none"> - Total monthly household income - Household's perception of changes in household income since pilot project was rolled out - Community perception of changes in household income of households targeted by the pilot project 	Quantitative Survey Household and community qualitative research	Baseline Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
	<ul style="list-style-type: none"> Decrease in household energy expenditure 	<ul style="list-style-type: none"> Monthly energy expenditure on fuel by type of fuel (kerosene, battery, SHS, SL, candles) Monthly expenditure on mobile phone charging Monthly expenditure on cooking fuel Household's perception of changes in household energy expenditure since programme was rolled out Community perception of changes in household energy expenditure of households targeted by the pilot project 	Quantitative Survey Household and community qualitative research	Baseline Endline
KEQ7. What have been unintended and/or unexpected outcomes of the pilot project?				
<i>No DEQ – one KEQ</i>	<ul style="list-style-type: none"> Unintended and/or unexpected uses of the SL/SHS among beneficiary households 		Quantitative Survey Household and community qualitative research	Endline
	<ul style="list-style-type: none"> Unintended and/or unexpected effects of SL/SHS use on beneficiary households' quality of life 	<ul style="list-style-type: none"> Primary cooking fuel used by household Female household member's time poverty Uses of SL / SHS Gendered differences in terms of quality of life: additional hours of light contribute to/hinder girls' ability to study Gendered differences in terms of labour market outcomes based on increased working days for women (reallocation of existing work burdens) Gendered differences in terms of health based on reduction of indoor air pollution, preventing women from exposure to kerosene-related health risks Improved ability to take loans based on repaying of SL/SHS loan that builds up beneficiaries' credit rating 	Quantitative Survey Household and community qualitative research	Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
	<ul style="list-style-type: none"> Unintended and/or unexpected outcomes of the pilot project at community level 	<ul style="list-style-type: none"> Gendered differences on outcomes at the community level: girls' educational outcomes Household and community perceptions of personal safety Changes in communication within community 	Household and community qualitative research	Endline
Efficiency				
KEQ8. What have been the strengths and weaknesses of the coordination process among key stakeholders involved in the implementation of the pilot project? What are lessons for scale-up and replication?	<ul style="list-style-type: none"> Strengths and weaknesses of the functioning of the coordination mechanisms at county and national level 	<ul style="list-style-type: none"> Type of coordination mechanism established Roles of coordination mechanisms Ongoing functioning of the coordination mechanism (county TWGs, national advisory committee) Integration/alignment of coordination mechanism with existing coordination mechanisms and coordination practices 	Documentation review (MoUs and minutes of coordination meetings) Key informant interviews (implementing partners, UNICEF, Sida, national and county government stakeholders, experts and development partners in the energy and social protection sectors, suppliers)	Endline
	<ul style="list-style-type: none"> Strengths and weaknesses of stakeholder participation in the coordination process 	<ul style="list-style-type: none"> Core national Ministries (Energy and Labour & Social Protection) and county government departments involved in the design of the pilot project Degree and frequency of participation of relevant stakeholders to supervise and provide guidance during implementation Government leadership in coordination process Coordination with private sector stakeholders during the design and implementation of the pilot project 	Documentation review (MoUs and minutes of coordination meetings) Key informant interviews (implementing partners, UNICEF, Sida, national and county government stakeholders, experts and development partners in the energy and social protection sectors, suppliers)	Endline
	<ul style="list-style-type: none"> Strengths and weaknesses of the content of the coordination process 	<ul style="list-style-type: none"> Coordination about the design and targeting of the pilot project Coordination about community engagement and communication Communication about programme progress, challenges and results 	Documentation review (MoUs and minutes of coordination meetings) Key informant interviews (implementing partners, UNICEF, Sida, national and county government stakeholders, experts and development partners in the	Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
		<ul style="list-style-type: none"> - Coordination about scale-up of the pilot project 	energy and social protection sectors, suppliers)	
<p>KEQ9. What have been the strengths and weaknesses of the engagement of community structures and leaders in the implementation of the pilot project? What are lessons for scale-up and replication in the NSNP?</p>	<ul style="list-style-type: none"> • Strengths and weaknesses of beneficiary engagement processes 	<ul style="list-style-type: none"> - Communication about the cash top-up and value of SL/SHS to beneficiaries - Training on the use of the SL/SHS and payment modalities - Training on livelihood activities - Access and use of beneficiary feedback/grievance mechanisms - Involvement of suppliers in beneficiary sensitisation 	<p>Routine monitoring data Quantitative survey Household and community qualitative research Key informant interviews (implementing partners, suppliers, county government staff)</p>	Endline
	<ul style="list-style-type: none"> • Strengths and weaknesses of the engagement of Beneficiary Welfare Committees (BWC) or community champions (CC) 	<ul style="list-style-type: none"> - Availability and capacity of BWCs or CCs to perform planned roles - Training and support that BWCs or CCs receive to perform planned roles - Support provided by BWCs and community champions in SL/SHS repayment - Support provided by BWCs and community champions in sensitisation and BCC - Monitoring, grievance resolution and reporting practices of BWCs and community champions - Communication between BWC/community champions and suppliers 	<p>Routine monitoring data Household and community qualitative research Key informant interviews (implementing partners, suppliers, county government staff, SAU)</p>	Endline
	<ul style="list-style-type: none"> • Strengths and weaknesses of the engagement with micro-entrepreneurs and last mile distributors 	<ul style="list-style-type: none"> - Selection and mobilisation of micro-entrepreneurs and last mile distributors - Training and support that micro-entrepreneurs/last mile distributors receive to perform planned roles - Linkages between micro-entrepreneurs/last mile distributors and suppliers 	<p>Routine monitoring data Household and community qualitative research Key informant interviews (implementing partners, suppliers, county government staff)</p>	Endline
Sustainability				

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
KEQ10. How well are factors that are likely to affect the sustainability and scalability of the pilot project addressed?				
DEQ10.1. How strong is stakeholder commitment to sustain and scale-up the pilot project?	<ul style="list-style-type: none"> Suppliers are interested in maintaining and expanding their supply chain in the targeted communities based on existing or changed delivery models and prices 	<ul style="list-style-type: none"> Interest in continuing / engaging in supply expressed by suppliers contracted by programme and others (as per 1.2 above). Delivery model that suppliers intend to use for expansion uses approaches that mean it is likely that most vulnerable households will be able to continue to participate 	Key informant interviews (suppliers, suppliers not contracted)	Endline
	<ul style="list-style-type: none"> Beneficiary households feel a sense of ownership towards the SL/SHS 	<ul style="list-style-type: none"> Frequency of use of SL / SHS in beneficiary households Condition of SL / SHS Beneficiaries understanding SL / SHS ownership after 12 months 	Quantitative survey Household and community qualitative research	Endline
	<ul style="list-style-type: none"> Key government stakeholders and/or development partners show interest/commitment to continuing and scaling up the pilot project using the existing or a changed approach 	<ul style="list-style-type: none"> Government department (REA or Ministry of Labour and Social Protection) that takes ownership of the pilot project. Degree of effort by appropriate government department(s) to either allocate budget or engage with other donor programmes (e.g. World Bank) to allocate funding to larger programmes based on learning from this pilot. Development partners' interest in the pilot project 	Key informant interviews (Ministry of Energy, REA, SPS, SPS, county authorities and key donors)	Endline
DEQ10.2. How financially sustainable is the intervention approach?	<ul style="list-style-type: none"> The beneficiary household are likely to be able to cover the replacement costs of SL/SHS or its components 	<ul style="list-style-type: none"> The costs of PAYG payments compared to typical household expenditure on kerosene, batteries and phone charging. Households' understanding of lifetime of product. Households' understanding of maintenance requirements and costs 	Quantitative survey Household and community qualitative research	Endline

Evaluation Questions	Criteria to answer the questions	Indicators and observable manifestations	Source of evidence	Timing of data collection
		- Ways to pay for solar systems beyond the end of the pilot project identified by households		
	<ul style="list-style-type: none"> The payment modalities facilitate sustained repayment of the SL/SHS by the beneficiary households 	<ul style="list-style-type: none"> Suppliers' plans to offer PAYG approaches for replacement parts / systems after the pilot project ends The costs of PAYG payments compared to typical household expenditure on kerosene, batteries and phone charging. Lessons learned from household experience with payment modalities 	Quantitative survey Household and community qualitative research Key informant interviews (implementing partners, suppliers, UNICEF, energy expert, micro-entrepreneurs/last mile distributors)	Endline
	<ul style="list-style-type: none"> Government stakeholders perceive the cash top-up priority use of public money 	<ul style="list-style-type: none"> Public fund priorities in the government departments responsible for energy and social protection Perceived reason why the cash top-up subsidy is considered priority or not for use of public money by government stakeholders 	Key informant interviews (Ministry of energy, REA, SPS, SAU, county authorities)	Endline
DEQ10.3. How well have operational modalities of the pilot project been integrated or aligned with the NSNP?	<ul style="list-style-type: none"> The beneficiary targeting and enrolment is well integrated or aligned with NSNP mechanisms 	- Alignment of targeting mechanism with NSNP targeting guidelines	Documentation review Key informant interviews (SPS, SAU)	Endline
	<ul style="list-style-type: none"> The cash top-up is well integrated or aligned with the NSNP mechanisms 	<ul style="list-style-type: none"> Timing of cash top-up payments Timing of regular CT payments 	Key informant interviews (SPS, SAU)	Endline
	<ul style="list-style-type: none"> The beneficiary grievance system is well integrated or aligned with the NSNP mechanisms 	<ul style="list-style-type: none"> Number of grievances received Channels used to report grievances Types of grievances received 	Routine monitoring data	Endline
	<ul style="list-style-type: none"> Coordination of the pilot project is well integrated or aligned with the NSNP mechanisms 	- Role of SPS, SAU in coordinating the pilot	Key informant interviews (SPS, SAU)	Endline

ANNEX C SAMPLING STRATEGY

This section provides technical detail on the sampling strategy for the baseline survey. It is worth noting that two rounds of sampling were conducted for the baseline survey. Initially, a sample of 1,620 households were drawn and interviewed. However, during data collection, the first phase of the SAU migration to the CCTP-MIS was concluded resulting in a significant change in the list of eligible households (i.e. sample frame) that was used to draw the sample. Consequently, the baseline sample was reduced by 75% and no longer representative of the new target population in terms of structure. This necessitated the sample to be topped-up from the new sample frame (described in greater detail below). Where necessary throughout this annex, both the initial sampling strategy and the top-up sampling strategy are described.

C.1 Population

The following sub-counties are included in the population¹: Ganze, Magarini and Kaloleni in Kilifi county and Balambala, Dadaab, Fafi and Ijara in Garissa county. The definition of the population is constricted by the circumstances on the ground. Particularly, areas of extreme security risk are excluded from the viable population as the operation of both implementation and evaluation teams would be unsafe.²

Within these areas, the population of households is restricted to those households eligible for enrolment in the Mwangaza Mashinani pilot project. Specifically, these are CT-OVC and/or OP-CT beneficiary households residing in off-grid communities in Kilifi and Garissa, that have at least one household member enrolled in and attending school and that do not possess a solar device with more than one bulb and who have indicated to be willing to pay 250 Ksh as a deposit for the solar device.

While the sample frame lists eligible registered beneficiaries (individuals) of the CT-OVC or OP-CT, each eligible registered beneficiary represents a single household and therefore, by drawing a list of registered beneficiaries, households are selected for the survey sample. The main unit of analysis is the household.

C.2 Sampling frame

The sampling frame is the list of all households that form the population and from which the sample was drawn.

C.2.1 Initial sampling frame

The initial sampling frame used in the first round of data collection was constructed by E4I through the verification exercise that took place in all of the designated sub-counties (both treatment and comparison). The first round of verification was

¹ The population or universe represents the entire group of units which is the focus of the study.

² Insecure villages included Fafi, Habajot and Welmarer (Fafi sub-county), Parmadha and Haji Mohamed (Ijara sub-county), Kulan and Liboi (Dadaab sub-county).

conducted by E4I between December 2018 and early February 2019. Verification was based on in-person visits by teams of enumerators to the beneficiaries known to be living in the designated areas. The verification questionnaire included all of the eligibility questions. These data were used to construct the sampling frame by applying the eligibility criteria to the successfully verified beneficiaries.

There were 2,629 households included in the sampling frame of which 1,995 households were in treatment sub-counties and 634 households were in comparison sub-counties.

C.2.2 Top-up sample frame

A supplemental round of verification was undertaken once phase 1 of the SAU migration was completed. This was run by E4I in all project sub-counties in Garissa and Kilifi but not in the comparison sub-counties. As a consequence, the verification in the comparison sub-counties of Balambala in Garissa and Kaloleni in Kilifi was run by Research Guide Africa's survey team as an integrated exercise of the primary data collection.

The top-up sample frame was therefore based on two data sources: verification data provided by the implementing partners in the treatment sub-counties and the CCTP-MIS data (which does not include specific data related to the eligibility criteria) in the comparison sub-counties. The treatment sample frame included 1,607 households and the comparison sampling frame included 1,804 unverified households. Based on the rate of eligibility in the treatment sub-counties, it was assumed that 735 of these households were likely to be eligible.

C.3 Sampling Method

Since a high ratio of the total population eligible for the pilot project was sampled for the evaluation, a sampling methodology was chosen that adheres to the required principles of the representativity of the proposed sample and randomness of the selection. A single stage sampling method was implemented as any optimisation of the costs and field logistics that would have been gained by the multistage approach is offset by the high sampling ratio where most geographical units suitable for primary stage clusters need to be included in the sample. A single sampling method applies the selection algorithm directly on the sample frame in its entirety.³

The use of a stratified systematic random selection method would have been ideal for drawing the sample. However, the high sampling ratio (above 50% of the population) in this context precluded the use of systematic methods. In order to retain control over the structure of the sample and thus ensure representativity, explicit stratification combined with a simple random sampling (SRS) within each stratum was used. Consequently,

³ Initially, the entire population (n = 634) of Kaloleni and Balambala needed to be included in the comparison group to ensure sufficient power of the impact analysis and hence no sampling took place. However, given that the comparison sample frame was expanded after the SAU migration, top-up households were sampled for the top-up round of data collection.

the allocation of the sample proportion in each explicit stratum is proportional to the size of each stratum in the population.

The definition of the explicit strata is based on the following criteria:

- Cash transfer type – CT-OVC or OP-CT
- Gender of the household head – Male or Female
- Sub-county - Ganze, Magarini, Kaloleni, Dadaab, Fafi, Ijara or Balambala.

As mentioned, the proposed sample includes beneficiaries from both targeted counties: Kilifi and Garissa. The allocation of the sample to the two counties is proportional to the total population in each county. As such, county was imposed as a super-strata with pre-defined allocations of the sample.

The SRS method of selection within each stratum is based on the random number generator.

Initial sample distribution

Based on the verification results and the operational sampling frame the initial split between the two counties was 71% (n=1,872) in Kilifi and 29% (n=757) in Garissa. Table 1 presents the initial size of the population in each and the division of the sample across sub-counties and treatment/comparison groups.

Table 1 Initial target populations and samples in Kilifi and Garissa

County/sub-county	Study Population ^a	Treatment sample	Comparison sample
Kilifi	1,872		
• Magarini/Ganze	1,369	702	
• Kaloleni	503		503
Garissa	757		
• Ijara/Dadaab/Fafi	626	284	
• Balambala	131		131

^a The target population was defined as verified CT-OVC/OP-CT households with at least one child aged 9-14 going to school AND willing to pay deposit AND without solar products AND no connection to the grid AND reside in security non-compromised areas as operationalised by UNDSS. This was in line with the eligibility criteria provided at the time of the initial sampling.

C.3.1 Sampling to adjust for initial mis-targeting

The result of the observed mis-targeting in the initial phase of the identification of the target population for the project pilot significantly reduced the eligible sample size and resulted in a sample that was no longer representative of the population in terms of structure. To ensure that the evaluation sample remained representative of the revised target population, the viable sample from the first phase of the baseline survey needed to be topped-up with new respondents to achieve the recommended reduced sample size of 1,200 households.⁴ The top-up sample also needed to correct the structure of the sample in order to make it representative of the new population. The

⁴ Revised power calculations were presented to UNICEF in a technical note entitled 'Mwangaza Mashinani baseline survey revision proposal and budget' shared on 14 March 2019.

representativeness of the sample is determined by the population structure as it is observed in the updated sampling frame and the operational strata used in the initial sampling approach. The sample deficit, as the result of the mis-targeting, affected all of the strata and all of the geographical locations.

The top-up sampling procedure follows the same methodology as the initial sampling – i.e. the same definitions of the explicit strata were used as well as the SRS method to select the units within each stratum. The top-up sampling approach accounts for the difference in structure across the strata between the leftover realised sample and the structure observed in the updated sampling frame. An example of the top-up sampling procedure is provided below.

Example: top-up sampling

This hypothetical example illustrates how the required top-up sizes were determined by stratum:

- Suppose stratum A represents 10% of the population where the population size is 3,000 households. Therefore, stratum A has 300 households.
- It follows that in a sample of 800 households, 80 households would be selected from stratum A.
- However, after the migration and change in the underlying database of the CT beneficiaries, the leftover sample indicates that there are 25 interviewed households remaining in the new stratum A.
- The top-up sample would therefore need to select 55 households from the remaining households in stratum A to reach the original target of 80 households.
- The number of eligible households in the frame to sample from is thus 275 households. This assumes that there are still 300 households in stratum A in the new population but 25 of them have already been interviewed (300 – 25).
- The sampling fraction would thus be $55/275$.

This process was applied across all of the identified strata in order to top each stratum up to the target size.

Top-up sample distribution

The updated and final sample based on the second round of verification was split between the two counties with 64% (n = 1,510) in Kilifi and 36% (n = 832) in Garissa. The allocation of sample to the strata below the county level is proportional to strata sizes within each county.

Table 2 Updated target populations and samples in Kilifi and Garissa

County/sub-county	Study Population ^a	Retained from initial	Top-up sample	Final sample
Kilifi				
• Ganze	475	90	83	173
• Magarini	587	93	121	214
• Kaloleni		148	241	387
Garissa				
• Dadaab	329	17	111	128
• Ijara	152	21	38	59
• Fafi	64	11	15	26
• Balambala		11	202	213

^a The target population is defined as verified CT-OVC/OP-CT households with at least one child going to school AND willing to pay deposit AND without solar products AND no connection to the grid AND reside in security non-compromised areas as operationalised by UNDSS.

C.4 Final sample size by strata

This section shows the final sample distribution by stratum in each county.

Table 3 Sample sizes in the specified strata in the final sample (Garissa treatment areas)

Sample type	County	CT Type	HH Head	Sub-county	Initial Sample	Final Sample	Top-up Sample
Treatment	Garissa	OP	F	Dabaab	11	43	37
Treatment	Garissa	OP	F	Fafi	11	9	3
Treatment	Garissa	OP	F	Ijara	6	20	15
Treatment	Garissa	OP	M	Dabaab	27	33	31
Treatment	Garissa	OP	M	Fafi	22	3	0
Treatment	Garissa	OP	M	Ijara	32	5	3
Treatment	Garissa	OVC	F	Dabaab	35	21	17
Treatment	Garissa	OVC	F	Fafi	48	5	4
Treatment	Garissa	OVC	F	Ijara	25	11	5
Treatment	Garissa	OVC	M	Dabaab	27	31	26
Treatment	Garissa	OVC	M	Fafi	29	9	8
Treatment	Garissa	OVC	M	Ijara	11	23	15
	TOTAL				284	213	164

Table 4 Sample sizes in the specified strata in the final sample (Kilifi treatment areas)

Sample type	County	CT Type	HH Head	Sub-county	Initial Sample	Final Sample	Top-up Sample
Treatment	Kilifi	OP	F	Ganze	70	71	28
Treatment	Kilifi	OP	F	Magarini	86	76	21
Treatment	Kilifi	OP	M	Ganze	71	10	4

Sample type	County	CT Type	HH Head	Sub-county	Initial Sample	Final Sample	Top-up Sample
Treatment	Kilifi	OP	M	Magarini	74	16	9
Treatment	Kilifi	OVC	F	Ganze	160	37	15
Treatment	Kilifi	OVC	F	Magarini	163	68	52
Treatment	Kilifi	OVC	M	Ganze	44	55	36
Treatment	Kilifi	OVC	M	Magarini	34	54	39
	TOTAL				702	387	204

Table 5 Sample sizes in the specified strata in the final sample (Garissa comparison area)

Sample type	County	CT Type	HH Head	Sub-county	Initial Sample	Final Sample	Top-up Sample
Comparison	Garissa	OP		Balambala		131	128
Comparison	Garissa	OVC		Balambala		82	73
	TOTAL				131	213	201

Note: gender of the household head was unknown in the top-up comparison sample frame.

Table 6 Sample sizes in the specified strata in the final sample (Kilifi comparison area)

Sample type	County	CT Type	HH Head	Sub-county	Initial Sample	Final Sample	Top-up Sample
Comparison	Kilifi	OP		Kaloleni		253	211
Comparison	Kilifi	OVC		Kaloleni		134	31
	TOTAL				503	387	242

Note: gender of the household head was unknown in the top-up comparison sample frame.

C.5 Weighting

No sampling weights are required for the proposed sample design. As the sampling was done using a stratified and proportional simple random selection, all of the sampling units contained within the frame had the same probability of being selected in the final analytical sample.

As the stratification was fully proportional no further post-stratification adjustments are required. This applies to both the initial sample and top-up sample as both samples were drawn to reflect the structure of the underlying population.

For the purpose of the analysis, the complex survey design setup is used in order to account for the stratification and to use the Finite Population Correction (FPC) adjustment for the estimation of the standard errors.

C.5.1 Replacements

In addition to the main sample, a sample of replacement households was also drawn using the same sampling methodology for both treatment and comparison sub-counties.⁵ Initially, five (n = 5) replacement households were selected in each stratum although in some cases, more than five replacements were required. The replacement households were randomised and were used in the random sequence. The replacement households were only used under strictly controlled circumstances, and were most commonly made when households could not be found or had moved out of the target sub-counties. The use of replacement households was strictly controlled by the survey management team.

Because households were replaced by randomly selected households in the same stratum and a low number of replacements were made, non-response is not considered to be an issue and the final sample remains representative of the underlying structure of the population.

Replacements that were made due to ineligibility in both the treatment sub-counties and comparison sub-counties as part of the integrated verification exercise are not a concern as they are considered to be part of the screening and verification process.

C.6 Advantage of the sampling method

The possibility of sampling across the two counties using a single stage random sampling technique (i.e. without clustering the sample) is a clear advantage related to this sampling strategy, for two main reasons. First, a more powered sample is achieved by avoiding the clustering of the sample and thus avoiding the design effect which has a detrimental effect on power. Second, sampling households randomly from both Kilifi and Garissa ensures a sample for the impact evaluation that is representative of the entire target population of the pilot project. This is achieved through the initial sampling and top-up sampling procedures.

⁵ No replacements were drawn for the comparison group in the initial round of data collection because the entire population was included in the sample.

C.7 Disadvantages of the sample method

Although separating treatment and comparison groups by sub-county helps to control for sub-county level spill-over effects of the pilot project, this represents a slight disadvantage for the impact evaluation. If households for the treatment and comparison groups were selected from across all sub-counties, it is reasonable to expect that their comparability would be further enhanced. Having treatment and comparison groups located in separate sub-counties is a second-best outcome in terms of comparability between the two groups. However, the fact that all the sub-counties were assessed to be eligible for project implementation entails that they are sufficiently similar to be compared. Besides, the impact estimation approach ensures their comparability by employing matching at the analysis stage.

ANNEX D SURVEY DESIGN AND IMPLEMENTATION

This Annex presents detail on the design of the quantitative baseline survey and the implementation of the baseline data collection.

D.1 Survey Instrument

The quantitative household impact evaluation relies primarily on a household survey conducted at baseline and that will be conducted again at endline. The purpose of collecting new data for this evaluation is to gather rich information that is not available from other datasets, such as on key outcome areas like education, health, livelihoods, energy access and time use. These are the outcome areas that UNICEF and the implementing partners agreed were of particular interest for the evaluation.

The household survey consists of several modules:

- Household member identification and basic information;
- Member details (including education and income);
- Member health;
- Education expenses;
- Household assets;
- Access to energy;
- Awareness of alternative sources of energy;
- Exposure to the intervention;
- Woman's time use;
- Child's time use.

The survey instrument was designed by OPM drawing on many widely used questionnaires including those from the DHS and World Bank as well as sector experts in OPM's poverty and social protection, health and natural resources and energy teams. The instrument was programmed using the World Bank's Survey Solutions and was comprehensively desk-tested ahead of the pre-test and main survey implementation. Comments from UNICEF and the implementing partners were incorporated into the final survey instrument. Further details on the survey QA process can be found in section 0.

D.2 Fieldwork

Data collection for the quantitative household survey was conducted simultaneously in Kilifi and Garissa. The first round of fieldwork was carried out between 11 February and 6 March 2019 with a second round of fieldwork commencing on 30 March and concluding on 22 April. The

fieldwork was conducted in 69 sub-locations across the two counties: 39 in Kilifi, and 30 in Garissa.

D.2.1 Fieldwork protocols

Fieldwork was undertaken by four field teams comprised of seven people each, accompanied by one supervisor. The size of each field team was determined by the number of interviews to be conducted in each county and the language requirements. Four supervisors from OPM's survey partner RGA's headquarters were responsible for supervising ongoing fieldwork, while a fieldwork manager was in charge of managing the overall activities.

A key challenge facing fieldwork teams for this survey was in the identification of sampled households particularly during the second round of fieldwork in the comparison sub-counties. Due to the fact that registration data was used to draw the sample without GPS coordinates, together with the pastoral nature of many of the households and communities in the sample, it was relatively common to find that households had relocated since the data in the sample frame (i.e. the MIS data) were collected. The fieldwork teams sought to track households that had relocated to within the sub-county, and if the household had moved away permanently or was not known in the community then the team would replace them with a random replacement from lists provided. The team used tracking forms with information about each household in the sample (drawn from the MIS data and E4I's verification data) to help them identify the households, and worked with local guides, elders and the chief in each community to help locate them.

Data collection was done using electronic tablets using the World Bank's Survey Solutions Interviewer application.

D.2.2 Fieldwork challenges.

The fieldwork faced a number of challenges in collecting data.

Data related challenges

Literacy: Literacy levels of the respondents is generally low with many respondents never having attended school. Low levels of literacy had an impact on the interview length as it increases the time taken to administer the questionnaire and, in Garissa, the time use modules were particularly challenging to administer due to poor understanding on the part of the respondents. Low literacy levels also impacted the language used to administer the survey, recording household members' ages and recording primary school children's marks.

Language: The enumerators encountered language challenges in parts of Kilifi county. In some villages in Ganze and Magarini, respondents did not speak Swahili. In these cases, enumerators found other community members, such as other family members or local leaders, to work with them as translators so that the interview could still be conducted with the main respondent. In Garissa, language did not pose a barrier and the interviews were conducted in Somali.

Age: The field teams faced challenges in collecting accurate data on household members' ages. Many respondents do not know their own age or the ages of other household members. Where possible, respondents were asked for birth certificates and identification cards but not all households had these documents. In these cases, enumerators worked with the respondents to try to approximate their age using historical events. If the age recorded in the survey is approximated, this is noted in the questionnaire. However, there were some cases where the age of the respondent and household members could not be approximated and is recorded as unknown.

School records: The survey asked about primary school-going children's achievements at school by recording the marks shown on their school report cards. During the pre-test and pilot, almost all households were found to have these report cards. However, in 72% of households in the sample, the report cards were unavailable. Recording children's marks without report cards as evidence, however, provides unreliable and noisy data as respondents were found not to know about the children's marks. Due to low levels of education, respondents struggled to estimate children's marks.

Programme cards: the implementing partners requested that data on households' programme number was collected. Most households had their programme cards and were able to show this to the enumerator. However, not all cards had a programme number. In some cases, the programme number field was blank while in other cases there was no programme number field at all. The addition of this question also revealed that some households in possession of a programme card have never received any money from the government through the cash transfer programmes.

Community Access Challenges

There were not any issues of community access. Local chiefs and leaders facilitated the work of the survey. However, access in Garissa was challenging due to long distances between sub-locations and a poor road network.

Security: In Garissa, insecurity was an issue and the team met with the sub-county commissioners, district officers and local chiefs in each sub-county ahead of starting the interviews in the area to assess the security situation. The team was advised not to go to Quramatha village for security reasons. In addition, the sub-county commissioner in Fafi advised the team not to work in Alinjugur sub-location as security operations were ongoing in this area at that time. Based on this advice, all 21 households in the sub-location were replaced.

Eligibility Challenges

The fieldwork teams faced some challenges in terms of locating eligible households to interview. In some cases, despite the verification exercise indicating that a household was eligible for the project, the interview revealed that the household did not meet the eligibility criteria. This was particularly the case regarding energy access.

Energy Access: In Bura location in Fafi sub-county, there is a scheme under the Kenyan government's rural electrification programme that provides households with power. Households

are asked to pay 1,000 Ksh and are then connected to the national grid. Although some households in Bura and surrounding communities have applied for the programme, they have not all been connected to the grid. In Dadaab town, some households are provided with access to electricity through the UNHCR for five hours per day. This service is provided for free.

Comparison verification: In Kaloleni and Balambala, re-verification had not taken place prior to the baseline survey. The survey team faced a high number of replacements in Kaloleni as only 47% of households met the eligibility requirements for the project. 53% of the households selected for the sample had to be replaced, in most cases because they already had solar devices with more than one bulb. The high prevalence of solar lighting in Kaloleni sub-county slowed down the progress of the survey team considerably. The team found the situation to be similar in Balambala and a high number of replacements were made due to households having access to electricity.

D.2.3 Fieldwork ethical standards

The evaluators endeavour to maintain the highest possible ethical standards throughout this evaluation. Regarding the implementation of the household survey, the following principles were followed:

- **Seeking the informed consent of all participants in data collection.** In practice, this entailed providing potential survey respondents with information about the content of the study and how their information would be used, as well as seeking to make them feel comfortable and empowered to refuse to participate or not answer any questions if they did not want to. The importance of seeking informed consent was emphasised during enumerator training.
- **Preserving the anonymity of research participants.** This means ensuring that participants would not have their personal information shared, or be at risk of being individually identified as a result of their participation in the survey. During fieldwork every effort was made to ensure that interviews were always conducted in a quiet and private location. During data analysis and the writing up of results, households' identifying information was not shared with anyone beyond the small analysis team, and it was ensured that no individuals could be identified in any reports written using the data collected from this survey.
- **Ensuring the safety of research participants** and respecting cultural sensitivities throughout all interactions with participants. Enumerator training included a module on safeguarding of research participants.
- **Protecting the safety of the local researchers who conducted data collection.** To protect local researchers during this assignment, close communication between all teams and OPM was maintained during the data collection, to allow any emerging concerns to be communicated, adhering to strict security protocols, and ensuring that the teams obtained all relevant permissions and authorisations to conduct data collection in each location. Sub-locations with known security issues were removed from the sample frame so that no data collection would be conducted there, and the option not to visit any other sub-location should security issues arise during the data-collection period was reserved.

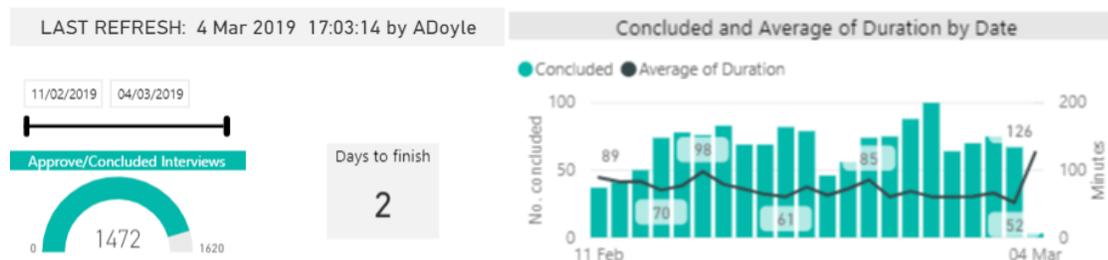
D.2.4 Quality assurance (QA)

To provide ongoing support to field teams during their assignment and protect the quality of the data, a rigorous QA process for the Mwangaza Mashinani survey was established.

The first element of the QA approach was careful training and piloting of the survey before implementation. This was essential to ensure that the questionnaire was well designed, and that fieldwork teams were thoroughly prepared to undertake the assignment. Training was conducted between 4 February and 7 February 2019, and a pilot was conducted before the main fieldwork on 9 and 10 February. A pre-test of the survey instrument and the tracking protocol was also conducted between 10 and 14 December 2018.⁶

The second crucial element of the QA approach was to develop a fieldwork model that emphasised close and regular communication between fieldwork teams, and between RGA field staff and OPM. OPM also accompanied RGA fieldwork staff for the initial roll-out of the survey, to support resolution of early challenges faced in implementation of the survey. This communication allowed teams to raise any issues they were facing and seek support early.

Figure 1 Extract from OPM monitoring system



In terms of the integrity of the data itself, there were two safeguards in place. The first was a series of basic consistency and range checks that were built into the survey instrument. These checks meant that interviewers would immediately be notified (during the interview) if data that they had entered fell outside an acceptable range or were inconsistent with a previous answer. Second, OPM and RGA teams were able to monitor data on an ongoing basis throughout the fieldwork to identify and respond quickly to any issues as they arose (see Figure 1). The ability to closely track quantitative data quality during its collection is an opportunity provided by electronic data collection that is not generally possible with paper-based surveys, where there is a lag in receiving data due to the need to enter them first. A systematic set of cleaning checks that each batch of new data was subject to was set up to check for consistency errors and high rates of anomalous responses. This was then fed back immediately to teams if any concerns became apparent.

⁶ Further details on the results of the pre-test are available in the inception report in Annex D.

D.2.5 Survey result

Table 7 presents the final number of households interviewed in each sub-county against the target sample.

Table 7 Households interviewed by sub-county

Sub-county	Number of households in sample	Number of completed interviews	Percentage complete
Treatment	600	600	100%
Ganze	173	173	100%
Magarini	214	214	100%
Dadaab	128	128	100%
Ijara	59	59	100%
Fafi	26	26	100%
Comparison	600	586	98%
Kaloleni	387	373	96%
Balambala	213	213	100%
Total	1,200	1,186	99%

The final sample comprised households interviewed over two rounds of data collection. Initially, the fieldwork targeted 1,620 households across the seven sub-counties. The survey result for the initial round of fieldwork is presented in Table 8.

Table 8 Progress by sub-county (initial fieldwork)

Sub-county	Number of households in sample	Number of households interviewed	Percentage complete	Date of completion
Ganze	345	345	100%	23 February
Magarini	357	357	100%	26 February
Kaloleni	503	465	92%	6 March
Dadaab	100	100	100%	19 February
Fafi	110	110	100%	28 February
Ijara	74	74	100%	22 February
Balambala	131	112	86%	6 March
Total	1,620	1,570	97%	6 March

However, given the change in target population and the need for a second round of fieldwork, the top-up fieldwork targeted an additional 811 households in order to reach the revised sample size of 1,200 households. The survey result from the second round of data collection is shown in Table 9.

Table 9 Progress by sub-county (top-up fieldwork)

Sub-county	Number of households in sample	Number of households interviewed	Percentage complete	Date of completion
Ganze	83	83	100%	26 March
Magarini	121	121	100%	30 March
Kaloleni	241	225	93%	16 April
Dadaab	111	111	100%	5 April
Fafi	15	15	100%	9 April
Ijara	38	38	100%	8 April
Balambala	202	202	100%	21 April
Total	811	795	98%	21 April

ANNEX E STATISTICAL TABLES (TREATMENT GROUP)

Table 10 Energy (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Light sources: Dry-cell battery torch	600	62.7	59.3	66	387	45.5	40.6	50.3	213	93.9	90.7	97.1	-48.4***
Light sources: Mobile phone torch	600	48.5	44.5	52.5	387	47.8	43	52.7	213	49.8	42.9	56.6	-2
Light sources: Kerosene/Paraffin/Tin lamp/ lantern	600	40.3	37.3	43.4	387	62.5	57.8	67.3	213	0	-	-	62.5***
Light sources: Firewood	600	34.5	30.9	38.1	387	43.4	38.6	48.2	213	18.3	13.1	23.5	25.1***
Light sources: Solar lantern	600	4	2.5	5.5	387	6.2	3.8	8.6	213	0	-	-	6.2***
Light sources: Solar home system	600	3.3	1.9	4.7	387	4.9	2.8	7	213	0.5	-0.4	1.4	4.4***
Light sources: Solar torch	600	2.8	1.5	4.1	387	3.6	1.8	5.5	213	1.4	-0.2	3	2.2*
Total household expenditure on all lighting sources per month	578	358.4	320	396.7	373	342.2	301	383.4	205	387.7	309.9	465.5	-45.5
Monthly household expenditure on kerosene, batteries and candles	532	284.8	266.4	303.2	333	315.4	288.3	342.5	199	233.5	214.6	252.4	81.9***
Household falls into tier 0 for lighting	600	98.3	97.3	99.3	387	97.4	95.9	99	213	100	-	-	-2.6***
Household falls into tier 1 for lighting	600	1.2	0.3	2	387	1.8	0.5	3.1	213	0	-	-	1.8***
Household monthly expenditure on cooking fuel (KES)	599	241.2	193.5	288.8	386	23.2	3.1	43.3	213	636.2	507.5	764.8	-613.0***
Household falls into tier 0 for phone charging. [All households with a mobile phone]	497	93.2	91	95.3	310	90.6	87.4	93.8	187	97.3	95	99.7	-6.7***
Household falls into tier 1 for phone charging. [All households with a mobile phone]	497	6.8	4.7	9	310	9.4	6.2	12.6	187	2.7	0.3	5	6.7***
Cost per mobile phone recharge (KES) [Households which do not charge at home]	463	25.1	22.2	28.1	281	29	24.4	33.7	182	19.1	16.9	21.2	10.0***
Monthly expenditure on mobile phone recharge [Households which do not charge at home]	463	279.3	235.3	323.2	281	285.1	215.6	354.6	182	270.3	238.8	301.7	14.8
Number of kerosene lamps in use in household	600	0.7	0.6	0.7	387	1	0.9	1.2	213	0	-	-	1.0***
Number of candles used in the household each month	5	6.8	-	-	4	7.5	-	-	1	4	-	-	3.5
Number of batteries used in the household each month	368	6.3	5.8	6.9	169	6.5	5.3	7.7	199	6.2	5.7	6.7	0.3

Indicator	Overall				Kilifi				Garissa				Diff
Monthly expenditure on lighting and phone charging together	600	560.7	508.7	612.8	387	536.9	469.4	604.4	213	604.1	523.9	684.3	-67.3

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Light sources: Dry-cell battery torch	282	70.9	66	75.9	318	55.3	50.5	60.2	15.6***	309	59.5	54.7	64.4	279	65.6	60.5	70.7	-6
Light sources: Mobile phone torch	282	47.9	42.1	53.6	318	49.1	43.7	54.5	-1.2	309	48.2	42.7	53.7	279	48.7	42.9	54.6	-0.5
Light sources: Kerosene/Paraffin/Tin lamp/lantern	282	36.2	31.5	40.8	318	44	39.2	48.8	-7.9**	309	36.2	31.7	40.8	279	45.5	40.7	50.3	-9.3***
Light sources: Firewood	282	31.2	26	36.5	318	37.4	32.3	42.5	-6.2*	309	37.5	32.4	42.7	279	31.5	26.2	36.9	6
Light sources: Solar lantern	282	4.3	1.9	6.6	318	3.8	1.7	5.8	0.5	309	3.6	1.5	5.6	279	4.3	2	6.6	-0.7
Light sources: Solar home system	282	3.9	1.7	6.1	318	2.8	1	4.6	1.1	309	2.3	0.6	3.9	279	4.7	2.2	7.1	-2.4
Light sources: Solar torch	282	3.9	1.7	6.1	318	1.9	0.4	3.4	2	309	2.3	0.6	3.9	279	3.6	1.4	5.7	-1.3
Total household expenditure on all lighting sources per month	272	354.3	299.3	409.3	306	362	308.7	415.3	-7.7	296	346.4	290.9	402	270	359.9	309.1	410.6	-13.4
Monthly household expenditure on kerosene, batteries and candles	254	274.4	248.8	300	278	294.3	267.8	320.7	-19.9	268	262.1	238.4	285.8	253	303.8	275.4	332.2	-41.7**
HH falls into tier 0 for lighting	282	98.9	97.7	100.1	318	97.8	96.2	99.4	1.1	309	99	98	100.1	279	97.5	95.7	99.3	1.5
HH falls into tier 1 for lighting	282	0.7	-0.3	1.7	318	1.6	0.2	2.9	-0.9	309	1	-0.1	2	279	1.4	0.1	2.8	-0.5
Household monthly expenditure on cooking fuel (KES)	282	295.7	213.1	378.4	317	192.6	134.6	250.6	103.2*	308	213.3	151.8	274.8	279	231.4	162.4	300.3	-18.1
Household falls into tier 0 for phone charging. [All households with a mobile phone]	237	91.1	87.6	94.7	260	95	92.4	97.6	-3.9*	259	94.6	91.9	97.3	230	91.3	87.7	94.9	3.3
Household falls into tier 1 for phone charging. [All households with a mobile phone]	237	8.9	5.3	12.4	260	5	2.4	7.6	3.9*	259	5.4	2.7	8.1	230	8.7	5.1	12.3	-3.3
Cost per mobile phone recharge (KES) [Households which do not charge at home]	216	24.5	19.6	29.4	247	25.6	22.1	29.2	-1.1	245	25	21.9	28.1	210	23.9	19.8	28	1.1
Monthly expenditure on mobile phone recharge [Households which do not charge at home]	216	298.4	214.8	382	247	262.6	224.1	301	35.9	245	258.4	225.9	290.9	210	270.3	219.5	321.1	-11.9

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
Number of kerosene lamps in use in household	282	0.7	0.6	0.8	318	0.7	0.6	0.8	0	309	0.5	0.4	0.6	279	0.8	0.7	0.9	-0.3***
Number of candles used in the household each month	2	9.5	-	-	3	5	-	-	4.5	4	7.5	-	-	1	4	-	-	3.5
Number of batteries used in the household each month	196	6.5	5.6	7.4	172	6.2	5.5	6.8	0.4	178	6.1	5.5	6.7	181	6.6	5.6	7.6	-0.5
Monthly expenditure on lighting and phone charging together	282	570.3	484	656.6	318	552.3	490.6	613.9	18	309	536.7	475	598.5	279	551.7	487.5	615.9	-14.9

Table 11 Access to Energy for Cooking (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff	Male Headed Household				Female Headed Household				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Cook using Traditional stone fire	600	96.5	95	98	387	97.9	96.5	99.3	213	93.9	90.7	97.1	4.0**	282	97.5	95.7	99.3	318	95.6	93.4	97.8	1.9
Cook using Improved traditional stone fire	600	2	0.9	3.1	387	1.8	0.5	3.1	213	2.3	0.3	4.4	-0.5	282	1.1	-0.1	2.2	318	2.8	1	4.6	-1.8
Cook using Ordinary jiko	600	1.3	0.4	2.2	387	0.3	-0.2	0.8	213	3.3	0.9	5.7	-3.0**	282	1.1	-0.1	2.3	318	1.6	0.2	2.9	-0.5
Cooking fuel: Firewood	600	98.5	97.5	99.5	387	99.7	99.2	100.2	213	96.2	93.6	98.8	3.5***	282	98.6	97.2	100	318	98.4	97.1	99.8	0.2
Cooking fuel: Charcoal	600	1.3	0.4	2.3	387	0.3	-0.2	0.8	213	3.3	0.9	5.7	-3.0**	282	1.4	0	2.8	318	1.3	0	2.5	0.2
Cooking occurs indoors	600	46.5	42.7	50.3	387	52.5	47.7	57.2	213	35.7	29.2	42.1	16.8**	282	47.9	42.1	53.6	318	45.3	40.1	50.5	2.6

Table 12 Awareness of Energy (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Households aware of solar systems (Households without solar)	545	68.6	64.7	72.5	336	74.4	69.8	79	209	59.3	52.7	66	15.1***
Household knows of at least one benefit of solar systems (Households without solar, but aware)	374	91.2	88.3	94.1	250	92	88.6	95.4	124	89.5	84	95	2.5
Household knows of more than one benefit of solar systems (Households without solar, but aware)	374	73	68.5	77.5	250	80	75	85	124	58.9	50.1	67.6	21.1***
Household knows of at least one benefit of solar systems (Households have solar)	55	96.4	91.3	101.5	51	96.1	-	-	4	100	-	-	-3.9
Visited by agent promoting solar devices (All households)	600	27.3	23.8	30.9	387	32.6	27.9	37.2	213	17.8	12.8	22.9	14.7***
Households that have discussed solar systems (All households)	600	21.2	17.9	24.4	387	23.5	19.4	27.7	213	16.9	11.9	21.9	6.6**
Household would like to buy a solar device (Households which do not have a solar device)	545	54.7	50.5	58.9	336	52.4	47.2	57.6	209	58.4	51.7	65.1	-6

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Households aware of solar systems (Households without solar)	252	65.1	59.2	71	293	71.7	66.5	76.9	-6.6*	285	71.9	66.7	77.2	249	66.3	60.4	72.2	5.7
Household knows of at least one benefit of solar systems (Households without solar, but aware)	164	93.9	90.2	97.6	210	89	84.8	93.3	4.9*	205	91.2	87.3	95.1	165	90.9	86.5	95.3	0.3
Household knows of more than one benefit of solar systems (Households without solar, but aware)	164	72.6	65.7	79.4	210	73.3	67.3	79.3	-0.8	205	72.7	66.5	78.8	165	73.3	66.5	80.1	-0.7
Household knows of at least one benefit of solar systems (Households have solar)	30	96.7	90	103.3	25	96	88	104	0.7	24	100	-	-	30	96.7	90	103.4	3.3
Visited by agent promoting solar devices (All households)	282	27	21.8	32.1	318	27.7	22.7	32.6	-0.7	309	28.8	23.7	33.9	279	26.9	21.7	32.1	1.9

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Households that have discussed solar systems (All households)	282	20.6	15.8	25.3	318	21.7	17.2	26.2	-1.1	309	23.9	19.2	28.7	279	19	14.4	23.6	5
Household would like to buy a solar device (Households which do not have a solar device)	252	56.3	50.2	62.5	293	53.2	47.5	59	3.1	285	54	48.2	59.8	249	55.4	49.2	61.6	-1.4

Table 13 Education (Member level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Currently attending school (aged 6-15)	1801	90.8	89.8	91.8	1136	97	96.2	97.8	665	80.2	77.8	82.5	16.9***
Regularly attending school (aged 6-15)	1801	83.7	82.3	85	1136	86.5	85	88.1	665	78.8	76.3	81.3	7.7***
Child promoted to the next grade (aged 6-15)	1576	89.2	88	90.4	1079	86	84.4	87.6	497	96.2	94.8	97.5	-10.2***
Currently attending school (aged 3-18)	2518	82.4	81.3	83.6	1628	89.3	88.1	90.4	890	69.9	67.5	72.3	19.4***
Regularly attending school (aged 3-18)	2518	75.3	73.9	76.6	1628	79.1	77.6	80.7	890	68.2	65.8	70.6	10.9***
Child promoted to the next grade (aged 3-18)	1916	86.1	84.9	87.3	1344	81.9	80.3	83.5	572	95.8	94.5	97.1	-13.9***

Indicator	Male Household Members				Female Household Members				Diff	CT-OVC				OP-CT				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Currently attending school (aged 6-15)	883	90.3	88.7	91.8	918	91.3	89.9	92.7	-1	907	92.5	91.2	93.8	850	89.6	88.1	91.2	2.9***
Regularly attending school (aged 6-15)	883	84.3	82.4	86.2	918	83.1	81.2	85	1.1	907	84.8	82.9	86.6	850	83.3	81.3	85.3	1.5
Child promoted to the next grade (aged 6-15)	765	90.3	88.7	92	811	88.2	86.4	89.9	2.2*	811	88.5	86.8	90.2	731	90	88.3	91.7	-1.5
Currently attending school (aged 3-18)	1257	82.4	80.8	84.1	1261	82.4	80.8	84	0	1259	83.2	81.6	84.8	1200	82.3	80.6	83.9	0.9
Regularly attending school (aged 3-18)	1257	76.3	74.4	78.1	1261	74.2	72.3	76.1	2.1	1259	76.1	74.2	78	1200	75.1	73.2	77	1
Child promoted to the next grade (aged 3-18)	949	86.2	84.5	87.9	967	85.9	84.2	87.7	0.3	968	85.3	83.6	87.1	907	87.2	85.5	88.9	-1.9

Table 14 Child Time Use (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Number of hours spent going to school	589	8.1	7.9	8.2	381	8.6	8.4	8.9	208	7	6.8	7.3	1.6***
Number of hours spent studying outside school	589	0.6	0.6	0.7	381	0.8	0.7	0.8	208	0.4	0.4	0.5	0.3***
Number of hours spent studying at home in daylight	589	0.1	0.1	0.2	381	0.2	0.1	0.2	208	0.1	0.1	0.1	0.1***
Number of hours spent studying at home during darkness	589	0.5	0.4	0.5	381	0.5	0.5	0.6	208	0.3	0.3	0.4	0.2***
Child does homework outside school	589	59.9	56.1	63.8	381	62.5	57.7	67.2	208	55.3	48.6	61.9	7.2*
Number of hours spent on leisure activities	589	1.6	1.5	1.7	381	1.8	1.6	2	208	1.3	1.1	1.4	0.5***
Number of hours spent on chores	589	0.8	0.7	0.8	381	1.1	1	1.2	208	0.1	0.1	0.2	1.0***
Number of hours spent sleeping	589	9.6	9.5	9.7	381	9.4	9.3	9.5	208	9.9	9.8	10	-0.5***
Number of hours spent on other activities	589	2.3	2.2	2.3	381	2.2	2.1	2.3	208	2.4	2.3	2.6	-0.3***
Number of hours spent studying (school & homework)	589	8.7	8.5	8.9	381	9.4	9.1	9.7	208	7.5	7.2	7.7	1.9***
Number of hours spent going to duksi/madrassa/other religious education	589	1.1	1	1.2	381	0.1	0	0.1	208	2.8	2.6	3.1	-2.8***

Indicator	Male Household Members				Female Household Members				Diff	Children in Lower Primary				Children in Upper Primary				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Number of hours spent going to school	287	7.9	7.6	8.1	302	8.3	8	8.5	-0.4**	427	7.6	7.4	7.8	162	9.3	9.1	9.6	-1.7***
Number of hours spent studying outside school	287	0.6	0.5	0.7	302	0.7	0.6	0.7	0	427	0.6	0.5	0.7	162	0.8	0.6	0.9	-0.2**
Number of hours spent studying at home in daylight	287	0.2	0.1	0.2	302	0.1	0.1	0.2	0	427	0.2	0.1	0.2	162	0.1	0.1	0.1	0.1*
Number of hours spent studying at home during darkness	287	0.4	0.4	0.5	302	0.5	0.4	0.6	-0.1	427	0.4	0.4	0.5	162	0.6	0.5	0.7	-0.2***
Child does homework outside school	287	59.6	54.1	65.1	302	60.3	54.8	65.7	-0.7	427	58.3	53.8	62.9	162	64.2	57	71.4	-5.9
Number of hours spent on leisure activities	287	1.6	1.4	1.8	302	1.6	1.4	1.8	0	427	1.8	1.7	2	162	0.9	0.8	1.1	0.9***
Number of hours spent on chores	287	0.7	0.6	0.9	302	0.8	0.7	0.9	0	427	0.8	0.7	1	162	0.5	0.4	0.7	0.3***
Number of hours spent sleeping	287	9.6	9.5	9.7	302	9.6	9.5	9.7	0	427	9.7	9.6	9.8	162	9.3	9.1	9.5	0.4***
Number of hours spent on other activities	287	2.3	2.2	2.4	302	2.3	2.2	2.3	0	427	2.2	2.1	2.3	162	2.4	2.3	2.5	-0.2**

Indicator	Male Household Members				Female Household Members				Diff	Children in Lower Primary				Children in Upper Primary				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Number of hours spent studying (school & homework)	287	8.5	8.2	8.8	302	8.9	8.7	9.2	-0.4**	427	8.2	8	8.4	162	10.1	9.8	10.4	-1.9***
Number of hours spent going to duksi/madrasa/other religious education	287	1.2	1.1	1.4	302	0.9	0.7	1	0.4**	427	1.2	1.1	1.3	162	0.7	0.5	0.9	0.5***

Table 15 Health (Member level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Symptoms of ARI in the last two weeks	4368	6.3	5.7	6.9	2934	8.6	7.7	9.4	1434	1.7	1	2.3	6.9***
Experienced eye irritation due to smoke in last one month	4387	11.8	11	12.6	2950	15	13.9	16.1	1437	5.1	4.1	6.2	9.9***
School child experienced eye irritation due to smoke in last one month	1329	10.1	8.6	11.6	895	13.3	11.2	15.4	434	3.5	1.8	5.1	9.8***
Household member experienced a burn related to lighting fuel	4383	2.6	2.2	3	2946	3.2	2.6	3.7	1437	1.5	0.9	2.1	1.6***

Indicator	Male Household Members				Female Household Members				Diff	Members aged 5 and younger				Members aged 6-15				Member aged 16 and older			
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI
Symptoms of ARI in the last two weeks	2011	5.5	4.6	6.3	2357	7	6.1	7.9	-1.5**	640	6.1	4.6	7.6	1784	4.8	4	5.7	1944	7.7	6.7	8.7
Experienced eye irritation due to smoke in last one month	2022	6.9	6	7.9	2365	15.9	14.7	17.2	-9.0***	640	4.4	3	5.8	1793	9.5	8.3	10.7	1954	16.3	14.9	17.7
School child experienced eye irritation due to smoke in last one month	647	7.6	5.7	9.5	682	12.5	10.1	14.8	-4.9***	-	-	-	-	-	-	-	-	-	-	-	-
Household member experienced a burn related to lighting fuel	2018	1.3	0.9	1.7	2365	3.8	3.1	4.4	-2.5***	639	1.7	0.8	2.6	1793	2.4	1.8	3	1951	3.1	2.5	3.8

Table 16 Health (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff	Male Head				Female Head				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Cooking occurs outdoors or in separate building	600	83.5	80.8	86.2	387	74.4	70.2	78.7	213	100	-	-	-25.6***	282	87.9	84.3	91.6	318	79.6	75.4	83.7	8.4***
Household burns kerosene inside the home	600	40.3	37.3	43.4	387	62.5	57.8	67.3	213	0	-	-	62.5***	282	36.2	31.5	40.8	318	44	39.2	48.8	-7.9**
Cooking occurs indoors	600	46.5	42.7	50.3	387	52.5	47.7	57.2	213	35.7	29.2	42.1	16.8***	282	47.9	42.1	53.6	318	45.3	40.1	50.5	2.6

Table 17 Livelihoods (Member level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Household member is working [All members 15 and above]	2077	68.5	67.1	69.9	1441	81.7	80.1	83.3	636	38.7	35.7	41.7	43.0***
Activity: Unpaid domestic work	1423	42.1	40.1	44.1	1177	41.2	39	43.4	246	46.3	41.5	51.2	-5.1*
Activity: Farming for own consumption	1423	37.5	35.7	39.3	1177	45.3	43.1	47.5	246	0.4	-0.2	1	44.9***
Activity: Collecting water	1423	25.1	23.4	26.8	1177	30.2	28.1	32.2	246	0.8	-0.1	1.7	29.3***
Activity: Collecting firewood or other fuel materials	1423	21.6	19.9	23.2	1177	25.9	23.9	27.9	246	0.8	-0.1	1.7	25.1***
Activity: Herding/Livestock producer (for yourself/unpaid)	1423	14.8	13.4	16.3	1177	15.1	13.5	16.7	246	13.4	10.1	16.7	1.7
Activity: Small scale business	1423	13.6	12.2	15	1177	12	10.5	13.4	246	21.1	17.1	25.2	-9.2***
Activity: Labourers in Mining/ Construction/ Manufacturing/ Agriculture	1423	5.9	4.9	6.9	1177	6.9	5.7	8	246	1.2	0.1	2.3	5.7***
Types of work engaged in per working member [All working members]	1423	1.8	1.7	1.8	1177	1.9	1.9	2	246	1	1	1	0.9***
Household member is not working - in education [All members 15 and above]	653	36.8	33.8	39.7	263	39.9	35.3	44.6	390	34.6	30.8	38.4	5.3*
Household member is not working – too old [All members 15 and above]	653	26.2	23.6	28.8	263	27	22.8	31.2	390	25.6	22.3	29	1.4
Household member is not working – unable to find work [All members 15 and above]	653	22.2	19.8	24.6	263	12.5	9.4	15.7	390	28.7	25.2	32.2	-16.2***
Household member is not working – unable to work [All members 15 and above]	653	11	9.1	12.9	263	12.2	9	15.3	390	10.3	7.9	12.6	1.9
Household members engaged in work during darkness [All working members]	1423	33.5	31.6	35.5	1177	31.4	29.3	33.5	246	43.5	38.6	48.4	-12.1***

Indicator	Overall				Kilifi				Garissa				Diff
Number of hours worked in the past week [All working members]	1423	44.7	43.5	45.9	1177	43.3	41.9	44.6	246	51.7	49.6	53.8	-8.5***
Number of hours worked per week using light [All members using artificial light]	476	12	11.5	12.4	369	11.2	10.7	11.7	107	14.6	13.4	15.8	-3.4***
Household member is part of saving scheme [All members 15 and above]	2076	11.1	10.1	12.2	1440	14.1	12.7	15.5	636	4.4	3.1	5.7	9.7***

Indicator	Male Household Members				Female Household Members				Diff	CT-OVC				OP-CT				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Household member is working [All members 15 and above]	878	62.3	59.9	64.7	1199	73.1	71.2	74.9	-10.8***	885	70.3	68.1	72.5	1150	67.7	65.8	69.7	2.5*
Activity: Unpaid domestic work	547	10.1	8.1	12	876	62.1	59.6	64.6	-52.0***	622	42.1	39.1	45.1	779	42.2	39.5	45	-0.1
Activity: Farming for own consumption	547	33.1	30	36.1	876	40.3	37.9	42.7	-7.2***	622	32.3	29.6	35	779	41.6	39	44.2	-9.3***
Activity: Collecting water	547	9.7	7.7	11.6	876	34.7	32.3	37.1	-25.0***	622	25.9	23.3	28.5	779	24.5	22.2	26.9	1.4
Activity: Collecting firewood or other fuel materials	547	5.7	4.1	7.2	876	31.5	29.1	33.9	-25.8***	622	22.2	19.7	24.7	779	21.2	19	23.4	1
Activity: Herding/Livestock producer (for yourself/unpaid)	547	23.8	21	26.6	876	9.2	7.7	10.8	14.5***	622	15.6	13.3	17.8	779	14.1	12.2	16	1.5
Activity: Small scale business	547	15.5	13.1	17.9	876	12.3	10.6	14	3.2**	622	17.5	15.2	19.9	779	10.5	8.8	12.2	7.0***
Activity: Labourers in Mining/ Construction/ Manufacturing/ Agriculture	547	10.1	8.1	12.1	876	3.3	2.4	4.2	6.7***	622	6.9	5.3	8.5	779	5.3	4	6.5	1.7
Types of work engaged in per working member [All working members]	547	1.3	1.3	1.4	876	2.1	2	2.1	-0.7***	622	1.8	1.8	1.9	779	1.8	1.7	1.8	0.1
Household member is not working - in education [All members 15 and above]	330	41.8	37.6	46	323	31.6	27.6	35.5	10.2***	263	41.8	37.1	46.5	370	34.1	30.2	37.9	7.8**
Household member is not working – too old [All members 15 and above]	330	22.4	18.9	25.9	323	30	26.1	33.9	-7.6***	263	17.9	14.2	21.6	370	32.2	28.4	35.9	-14.3***
Household member is not working – unable to find work [All members 15 and above]	330	22.4	18.9	26	323	22	18.5	25.5	0.4	263	25.9	21.8	29.9	370	18.9	15.8	22	6.9***
Household member is not working – unable to work [All members 15 and above]	330	10	7.4	12.6	323	12.1	9.3	14.9	-2.1	263	10.6	7.7	13.6	370	10.8	8.3	13.3	-0.2
Household members engaged in work during darkness [All working members]	547	7.5	5.8	9.2	876	49.8	47.2	52.4	-42.3***	622	33.8	30.8	36.7	779	33.5	30.9	36.1	0.3

Indicator	Male Household Members				Female Household Members				Diff	CT-OVC				OP-CT				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Number of hours worked in the past week [All working members]	547	39.1	37.4	40.8	876	48.2	46.6	49.8	-9.1***	622	48.8	47	50.7	779	41.5	39.9	43	7.4***
Number of hours worked per week using light [All members using artificial light]	41	9	7.9	10.2	435	12.2	11.7	12.7	-3.2***	209	12.2	11.4	12.9	261	11.7	11.1	12.4	0.4
Household member is part of saving scheme [All members 15 and above]	877	4.8	3.7	5.9	1199	15.8	14.2	17.4	-11.0***	885	12.4	10.7	14.1	1149	10.4	9.1	11.8	2.0*

Table 18 Livelihoods (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Total income generating activities per household [Households with income generating activities]	537	4.7	4.4	5	372	6.1	5.7	6.6	165	1.5	1.4	1.6	4.6***
Number of income generating activities started in the last 12 months [Households with income generating activities]	537	1.5	1.3	1.6	372	1.5	1.3	1.8	165	1.2	1.1	1.4	0.3*
Household monthly total income (KES)	600	3882.4	3389.3	4375.4	387	2996.4	2539.8	3453	213	5492	4379.3	6604.8	-2495.6***
Household monthly income excluding remittances (KES)	588	3041.3	2590.6	3491.9	385	2663.5	2212.8	3114.2	203	3757.6	2771.6	4743.7	-1094.1**
Proportion of activities conducted at home [Households with income generating activities]	537	41.1	38.2	44	372	37.4	34.3	40.5	165	49.5	43.1	55.9	-12.1***

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Total income generating activities per household [Households with income generating activities]	257	5	4.5	5.5	280	4.4	4	4.9	0.6	275	4.1	3.7	4.5	251	5.4	4.9	6	-1.3***
Number of income generating activities started in the last 12 months [Households with income generating activities]	257	1.5	1.2	1.8	280	1.4	1.1	1.6	0.2	275	1.6	1.3	1.9	251	1.3	1.1	1.6	0.3
Household monthly total income (KES)	282	3954.6	3153.3	4756	318	3818.2	3212.5	4424	136.4	309	4128.1	3436.9	4819.3	279	3648.1	2922.6	4373.6	480

Indicator	Male Headed Household				Female Headed Household				Diff	CT-OVC				OP-CT				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Household monthly income excluding remittances (KES)	276	3314.7	2540.5	4088.8	312	2799.4	2294.9	3303.9	515.3	303	3268.4	2657.6	3879.3	273	2805.6	2124.9	3486.3	462.9
Proportion of activities conducted at home [Households with income generating activities]	257	42.7	38.5	46.9	280	39.7	35.5	43.8	3	275	36.1	32.1	40.1	251	46.4	42.1	50.8	-10.4***

Table 19 Women's Time Use (Household level indicators)

Indicator	Overall				Kilifi				Garissa				Diff
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	
Number of hours spent on productive activities	566	9.7	9.4	10	370	10.3	10	10.7	196	8.5	8.1	9	1.8***
Number of hours spent on paid labour	566	1.4	1.2	1.6	370	1.3	1	1.5	196	1.6	1.2	2	-0.3
Number of hours spent on unpaid labour	566	6.9	6.6	7.1	370	7.7	7.3	8	196	5.4	5.1	5.7	2.3***
Number of hours spent on leisure activities	566	4	3.8	4.3	370	3.5	3.2	3.7	196	5.1	4.6	5.6	-1.6***
Woman is time poor	566	33.9	30.2	37.6	370	40.8	36	45.6	196	20.9	15.3	26.6	19.9***

Indicator	Women aged 16-20				Women aged 21 and older				Diff	Woman is the household head				Woman is the spouse				Woman is another household member			
	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI		N	%	Low CI	Upper CI	N	%	Low CI	Upper CI	N	%	Low CI	Upper CI
Number of hours spent on productive activities	145	9.2	8.6	9.8	418	9.8	9.5	10.2	-0.7*	159	10.3	9.7	10.8	98	10.3	9.9	10.8	309	9.2	8.8	9.6
Number of hours spent on paid labour	145	1.5	1	2	418	1.3	1	1.5	0.2	159	2.1	1.6	2.6	98	1.2	0.7	1.7	309	1.1	0.8	1.4
Number of hours spent on unpaid labour	145	6.2	5.7	6.8	418	7.1	6.8	7.4	-0.9***	159	6.8	6.3	7.3	98	7.3	6.7	7.9	309	6.8	6.4	7.2
Number of hours spent on leisure activities	145	4.3	3.8	4.9	418	3.9	3.7	4.2	0.4	159	3.5	3	3.9	98	3.5	3.1	3.9	309	4.5	4.1	4.8
Woman is time poor	145	32.4	25	39.9	418	34	29.6	38.3	-1.6	159	40.3	32.7	47.8	98	33.7	24.4	42.9	309	30.7	25.8	35.7

ANNEX F PSM AND BALANCE DIAGNOSTICS

This annex provides some technical detail on the PSM approach and presents the complete set of balance diagnostics for all impact areas and headline indicators as outlined in section 6 of Volume I.

F1. Propensity Score Matching

PSM is a two-stage analytical approach that employs a propensity score as a 'comparator metric' that summarises the information provided by these relevant characteristics. The first stage is used to compute the propensity score for each unit of observation using a set of covariates (variables) that represent these relevant characteristics. In the second stage, outcome indicators of interest are compared across matched treatment and comparison groups to estimate treatment effects (the impact of the Mwangaza Mashinani pilot project, in this case). At baseline, the focus is on the first part of the PSM protocol, thus selecting the set of relevant covariates, computing the propensity score and matching households (the unit of observation) with similar propensity scores.

Specifically, to estimate the propensity score in the first stage, the procedure suggested by Imbens and Rubin (2015) is followed. The propensity scores are estimated by first specifying treatment and comparison assignment as a binary variable that has values 0 (for comparison) and 1 (for treatment). The estimated scores are then modelled as the fitted values that are derived from a logit or probit estimation, with the binary treatment variable as the dependent variable and the covariates across which balance is supposed to be achieved as the regressors. A three-step approach is employed to identify an optimal selection model comprising the set of covariates to be included in this first stage estimation of the propensity score. The three-step approach comprises of the following sequence:

1. **Select a set of basic covariates based on substantive grounds:** The starting point is to select variables theoretically expected to be correlated with treatment status and treatment effects, thereby introducing selection bias between treatment and comparison groups;
2. **Increase the set of valid covariates based on algorithmic approaches:** Backward and forward stepwise regressions are then employed as variable selection algorithms to identify valid variables significantly correlated with both treatment status and outcome variables;
3. **Increase the set of covariates with polynomial and interaction terms:** The same method of stepwise regressions is employed to augment the set of covariates by quadratic terms or interactions of variables selected in the first two steps. The rationale is that balance might only be achieved if the propensity score is estimated using non-linear transformations.

Once the optimal selection model is identified, a matching algorithm is applied to match comparison and treatment units to each other based on the propensity score estimated in the first stage. The Kernel matching algorithm is used at baseline,⁷ which is a non-parametric

⁷ Kernel matching with appropriate trimming and enforcement of common support was selected as a good compromise between alternative matching approaches. In general, the selection of models was based on the fact that

matching approach that allows for different trimming and bandwidths levels to be imposed on the propensity score. Since the propensity score effectively works as a balancing score, achieving balance conditioning on the propensity score means that selection bias is removed between comparison and treatment groups.

Assessing balance of covariates after matching is therefore a key step for the PSM modelling. At baseline, balance is assessed along a variety of dimensions both at the individual covariate level and overall, by summarising covariate balance in treatment and comparison groups. The comprehensive balance diagnostics are presented in the next section.

F2. Balance Diagnostics

This section provides comprehensive reports on the balance diagnostic testing across all impact areas building on the example presented in Section 6 of Volume I. The indicators used in each impact area are shown in Table 20.

Table 20 Impact Areas for assessing balance

Impact Area	Headline indicator	Robustness check indicator	Sample used
Education	Proportion of household members aged 3 to 18 attending school	Proportion of household members aged 3 to 18 regularly attending school	Households with at least one member aged 3 to 18
Health	Proportion of household members experiencing eye irritation in the last one month	Proportion of household members experiencing burns in the last six months	All households
Livelihoods	Total household income	Number of working household members per household	All households
Energy Access	MTF energy access	Household has used kerosene in the last 30 days	All households
Awareness of alternative sources of energy	Household aware of solar energy	Household has been visited by someone selling solar devices in the last 12 months	All households
Women's time use	Hours spent on productive activities in a usual day	Hours spent on leisure activities in a usual day	Households with a female household head, a female spouse or a female household member older than 15

discriminating between models poses a bias/variance trade-off in the estimated treatment effect. For instance, in the extreme case of nearest neighbour (NN) matching with just one neighbour, it could be that the NN is actually quite far away in terms of propensity scores and hence a bad match. If this happens often, this could introduce bias into the estimation procedure. A solution to this could be to implement matching using several comparators in a caliper matching setting. However, this could decrease the number of available matches, which could increase the variance of the treatment estimate.

Impact Area	Headline indicator	Robustness check indicator	Sample used
Children’s time use	Hours spent studying in a usual day	Hours spent on religious activities in a usual day	Households with one child enrolled in primary school (P1-P8)

The balance diagnostics for time use indicators are presented separately here because the populations of interest are different to the impact areas in which they fall. For example, while children’s study time is an indicator in the education section, the indicator is measured for all households rather than just households with a household member aged 3-18. Similarly, women’s time use is only measured for households with an eligible female⁸ while livelihoods indicators are measured for all households. To understand how to read these graphs and tables, please refer to the example shown in section 6 of Volume I.

⁸ An eligible female respondent is defined as the female household head or the female spouse or a random female household member above the age of 15.

F.2.1 Awareness of Alternative Energy

Table 21 Awareness of Alternative Energy: PSM Model Parameters

Model Parameters	Value
Bandwidth	2
Trimming	5
Indicator	Household is aware of solar energy

Figure 2 Awareness of Alternative Energy: Balance diagnostics

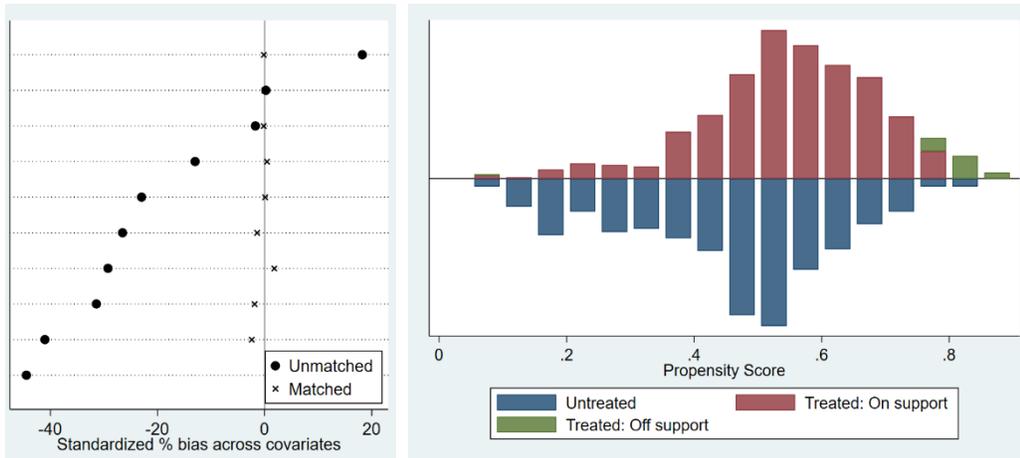


Table 22 Awareness of Alternative Energy: Balance indicators

	Before Matching	After matching
Rubin's B	66.96	6.17
Rubin's R	0.69	1.04
N on common support		1,139

F.2.2 Education

Table 23 Education: PSM Model Parameters

Model Parameters	Value
Bandwidth	2
Trimming	3
Indicator	Proportion of household members aged 3 – 18 currently attending school

Figure 3 Education: Balance diagnostics

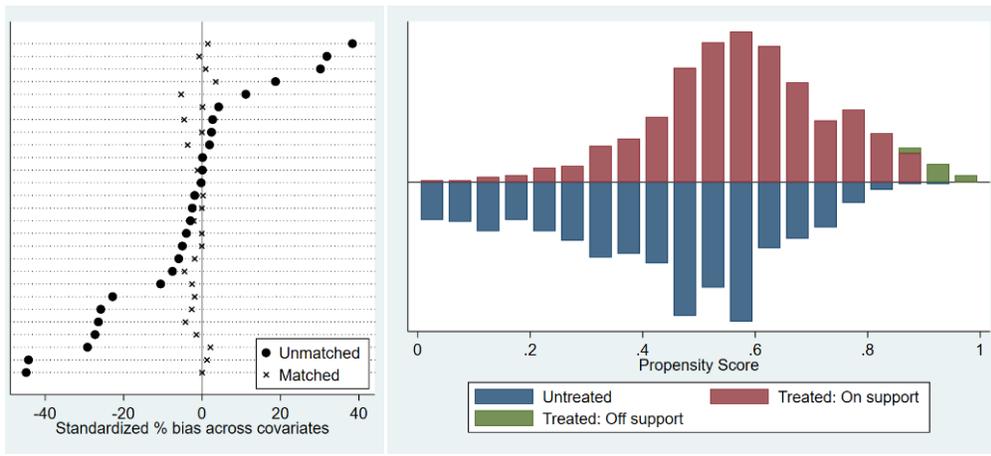


Table 24 Education: Balance indicators

	Before Matching	After matching
Rubin's B	75.59	12.91
Rubin's R	0.62	1.06
N on common support		1,148

F.2.3 Health

Table 25 Health: PSM Model Parameters

Model Parameters	Value
Bandwidth	2
Trimming	3
Indicator	Proportion of household members with symptoms of eye irritation

Figure 4 Health: Balance diagnostics

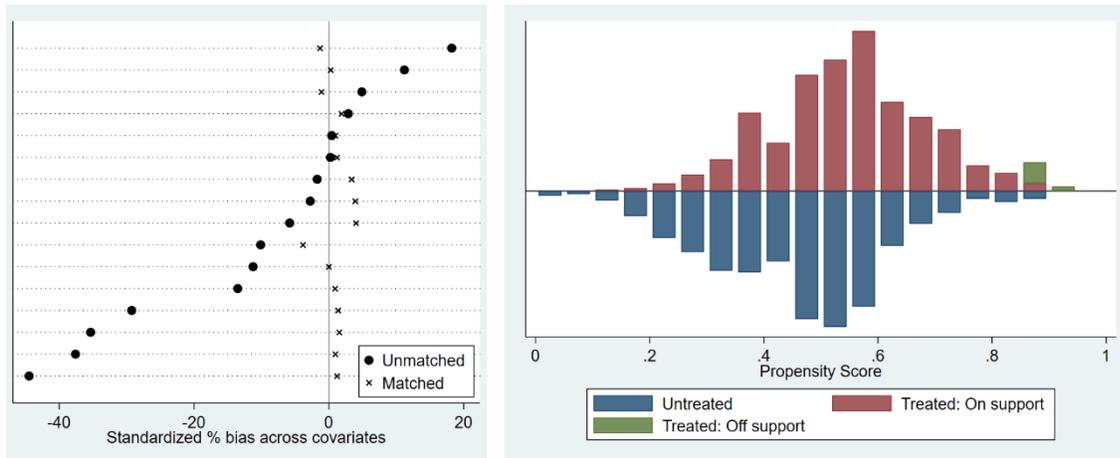


Table 26 Health: Balance indicators

	Before Matching	After matching
Rubin's B	64.63	10.16
Rubin's R	0.83	1.16
N on common support		1,151

F.2.4 Livelihoods

Table 27 Livelihoods: PSM Model Parameters

Model Parameters	Value
Bandwidth	6
Trimming	15
Indicator	Total household income

Figure 5 Livelihoods: Balance diagnostics

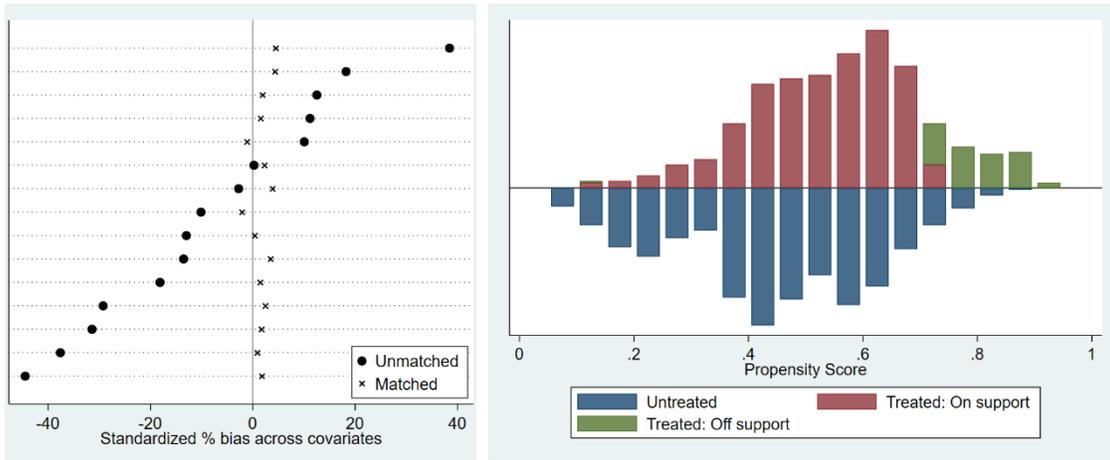


Table 28 Livelihoods: Balance indicators

	Before Matching	After matching
Rubin's B	72.76	11.58
Rubin's R	0.76	1.18
N on common support		1,079

F.2.5 Time use - women

Table 29 Women's time use: PSM Model Parameters

Model Parameters	Value
Bandwidth	4
Trimming	3
Indicator	Number of hours spent on productive activities on a typical day

Figure 6 Women's time use: Balance diagnostics

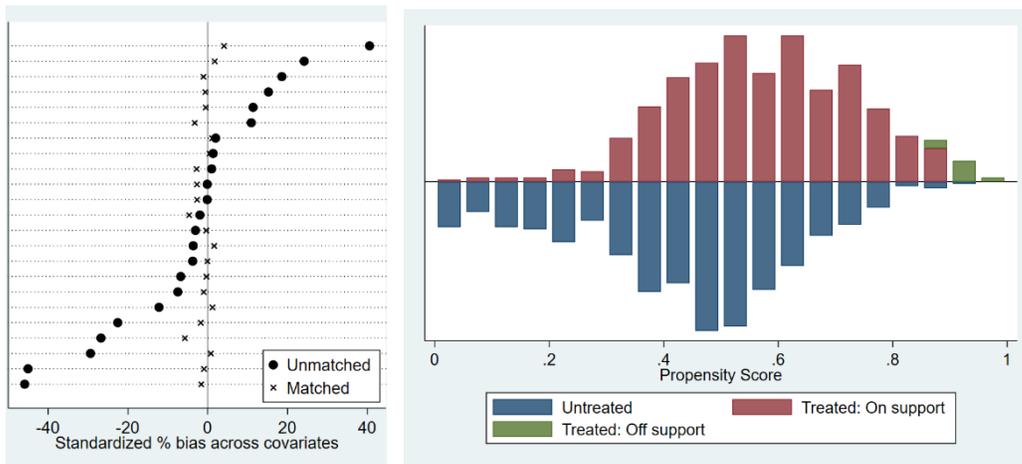


Table 30 Women's time use: Balance indicators

	Before Matching	After matching
Rubin's B	81.53	13.37
Rubin's R	0.62	1.04
N on common support		1,091

ANNEX G CALCULATING ACCESS TO TIER 1 LIGHTING SERVICES

The three core benchmarks of lighting service are 0, 100, and 1,000 lumen-hours per day. The relationship for estimating the access level based on brightness begins at the “zero” point: access for 0 persons at 0 lumen-hours. Even very small amounts of modern light are counted. From 0 to 100 lumen-hours, there are increasing levels of access for additional light, reflecting increased utility as the quantity approaches levels that are typically available from fuel-based lighting (roughly 25 lumens for 4 hours a day or 100 lumen-hours). Based on user self-reported expectations for brightness and run-time, combined with the fact that low-level lighting is an individual service, a second benchmark is placed at 100 lumen-hours for meeting the needs of one person. Multiple people using the same light source simultaneously can often reduce the utility of lighting because it can be difficult optically to spatially distribute light where it is needed for meeting joint needs. Thus, there are declining access returns on additional light as more people are served, up to a full (typical/average size) household of five being served by 1,000 lumen-hours. This represents the third benchmark for lighting.

Two different mathematical functions are used to link the benchmarks (see Figure 7). The first, from 0 to 100 lumen-hours per day, has increasing returns on additional light and takes a logistic form. The logistic function is defined so it passes through the benchmarks and a “tuning” benchmark of 1/100th of a person at a light level equivalent to half the service from a candle (20 lumen-hours per day). Above 100 lumen-hours per day, a logarithm (base 10) that reflects the declining returns to lighting is used. It passes through the benchmarks at 100 and 1,000 lumen-hours per day. At levels above 1,000 lumen-hours per day from a particular source, additional persons can be served following the logarithmic function.

Figure 7 Equations linking benchmarks

For devices from 0–100 lmhr/day	For devices from 100–1,000 lmhr/day	Total number of persons served in the household
<i>A logistic function</i>	<i>A logarithmic function</i>	<i>A summation function</i>
$P_i = d \left(1 - \frac{1}{1 + (\frac{L}{e})^f} \right)$ <p>where: P_i = number of persons served with lighting service by the device L = quantity of available light (lmhr/day) $d = 2$ $e = 100$ $f = 3.3$</p>	$P_i = 0 < h_{max} \times \log_{10} \left(\frac{L}{a} + b \right) - c < h$ <p>where: P_i = number of persons served with lighting service by the device L = quantity of available light (lmhr/day) $a = 95$ $b = 0.732$ $c = 0.0515$ $h_{max} = 5$ h = household size</p>	<p>Sum for all the light sources in a household:</p> $P_{tot} = \max \left(\sum_i P_{i,j}, h \right)$ $T_i = \frac{P_{tot}}{h}$ <p>where: P_{tot} = number of persons served with lighting service in total h = household size T_i = effective tier for lighting</p>

The number of persons who are served with Tier 1 access by a set of lighting systems is the sum of the number of persons whose needs are served by each independent light source, subject to a maximum of the household size itself.

ANNEX H STATISTICAL TABLES (CONTROL GROUP)

Table 31 Energy (Household level indicators)

Indicator	Overall		Kilifi		Garissa		Diff
	N	%	N	%	N	%	
Light sources: Dry-cell battery torch	586	61.6	373	39.9	213	99.5	-59.6
Light sources: Mobile phone torch	586	48	373	54.7	213	36.2	18.5
Light sources: Kerosene/Paraffin/Tin lamp/ lantern	586	56.1	373	88.2	213	0	88.2
Light sources: Firewood	586	30	373	35.4	213	20.7	14.7
Light sources: Solar lantern	586	2.2	373	3.5	213	0	3.5
Light sources: Solar home system	586	1.5	373	2.4	213	0	2.4
Light sources: Solar torch	586	3.1	373	4.8	213	0	4.8
Total household expenditure on all lighting sources per month	575	446.8	364	531.5	211	300.7	230.8
Monthly household expenditure on kerosene, batteries and candles	565	414.1	354	522.7	211	232	290.7
Household falls into tier 0 for lighting	586	99.8	373	99.7	213	100	-0.3
Household falls into tier 1 for lighting	586	0.2	373	0.3	213	0	0.3
Household monthly expenditure on cooking fuel (KES)	584	141	373	93.4	211	225.1	-131.7
Household falls into tier 0 for phone charging. [All households with a mobile phone]	516	95.3	329	96	187	94.1	1.9
Household falls into tier 1 for phone charging. [All households with a mobile phone]	516	4.7	329	4	187	5.9	-1.9
Cost per mobile phone recharge (KES) [Households which do not charge at home]	492	20.9	316	20	176	22.6	-2.7
Monthly expenditure on mobile phone recharge [Households which do not charge at home]	492	240.7	316	201.9	176	310.3	-108.3
Number of kerosene lamps in use in household	586	1.2	373	1.9	213	0	1.9
Number of candles used in the household each month	4	4.5	4	4.5	0	-	-
Number of batteries used in the household each month	354	6.8	145	8.3	209	5.8	2.5***
Monthly expenditure on lighting and phone charging together	586	640.5	373	689.7	213	554.3	135.5

Indicator	Male Headed Household		Female Headed Household		Diff	CT-OVC		OP-CT		Diff
	N	%	N	%		N	%	N	%	
Light sources: Dry-cell battery torch	273	67.8	313	56.2	11.5	203	60.6	363	62	-1.4
Light sources: Mobile phone torch	273	47.6	313	48.2	-0.6	203	48.8	363	47.1	1.7
Light sources: Kerosene/ Paraffin/Tin lamp/ lantern	273	53.1	313	58.8	-5.7	203	50.2	363	59.5	-9.3
Light sources: Firewood	273	31.5	313	28.8	2.7	203	26.1	363	32.8	-6.7
Light sources: Solar lantern	273	2.2	313	2.2	0	203	1	363	3	-2
Light sources: Solar home system	273	1.5	313	1.6	-0.1	203	1.5	363	1.7	-0.2
Light sources: Solar torch	273	2.9	313	3.2	-0.3	203	2.5	363	3.6	-1.1
Total household expenditure on all lighting sources per month	270	425.1	305	466	-41	198	400.6	357	476.2	-75.6
Monthly household expenditure on kerosene, batteries and candles	264	413.3	301	414.9	-1.7	195	347	350	453.5	-106.5
HH falls into tier 0 for lighting	273	99.6	313	100	-0.4	203	99.5	363	100	-0.5
HH falls into tier 1 for lighting	273	0.4	313	0	0.4	203	0.5	363	0	0.5
Household monthly expenditure on cooking fuel (KES)	272	95.6	312	180.6	-85	203	120.4	361	160.4	-39.9
Household falls into tier 0 for phone charging. [All households with a mobile phone]	243	95.9	273	94.9	1	184	96.2	318	94.7	1.5
Household falls into tier 1 for phone charging. [All households with a mobile phone]	243	4.1	273	5.1	-1	184	3.8	318	5.3	-1.5
Cost per mobile phone recharge (KES) [Households which do not charge at home]	233	20.8	259	21	-0.2	177	20.7	301	21.1	-0.4
Monthly expenditure on mobile phone recharge [Households which do not charge at home]	233	253.4	259	229.2	24.2	177	233.6	301	246.9	-13.3
Number of kerosene lamps in use in household	273	1.3	313	1.2	0.1	203	0.9	363	1.4	-0.6
Number of candles used in the household each month	1	6	3	4	2	2	3.5	2	5.5	-2
Number of batteries used in the household each month	180	7.2	174	6.5	0.7	122	5.7	219	7.6	-1.9***
Monthly expenditure on lighting and phone charging together	273	636.7	313	643.8	-7.1	203	594.4	363	673.1	-78.7

Table 32 Access to Energy for Cooking (Household level indicators)

Indicator	Overall		Kilifi		Garissa		Diff	Male Headed Household		Female Headed Household		Diff
	N	%	N	%	N	%		N	%	N	%	
Cook using Traditional stone fire	586	99.1	373	99.2	213	99.1	0.1	273	98.2	313	100	-1.8
Cook using Improved traditional stone fire	586	0.3	373	0.3	213	0.5	-0.2	273	0.7	313	0	0.7
Cook using Ordinary jiko	586	0.3	373	0.3	213	0.5	-0.2	273	0.7	313	0	0.7
Cooking fuel: Firewood	586	99.3	373	98.9	213	100	-1.1	273	99.3	313	99.4	-0.1
Cooking fuel: Charcoal	586	0	373	0	213	0	0	273	0	313	0	0
Cooking occurs indoors	586	57.2	373	68.1	213	38	30.1	273	57.9	313	56.5	1.3

Table 33 Awareness of Energy (Household level indicators)

Indicator	Overall		Kilifi		Garissa		Diff
	N	%	N	%	N	%	
Households aware of solar systems (Households without solar)	550	81.6	337	85.2	213	76.1	9.1
Household knows of at least one benefit of solar systems (Households without solar, but aware)	449	91.8	287	91.6	162	92	-0.3
Household knows of more than one benefit of solar systems (Households without solar, but aware)	76.2	72.2	287	80.1	162	69.1	11
Visited by agent promoting solar devices (All households)	586	24.6	373	29.2	213	16.4	12.8
Households that have discussed solar systems (All households)	586	17.1	373	19.8	213	12.2	7.6
Household would like to buy a solar device (Households which do not have a solar device)	550	66	337	68	213	62.9	5

Indicator	Male Headed Household		Female Headed Household		Diff	CT-OVC		OP-CT		Diff
	N	%	N	%		N	%	N	%	
Households aware of solar systems (Households without solar)	258	84.9	292	78.8	6.1*	196	83.7	334	80.2	3.4
Household knows of at least one benefit of solar systems (Households without solar, but aware)	258	84.9	292	78.8	6.1*	196	83.7	334	80.2	3.4
Household knows of more than one benefit of solar systems (Households without solar, but aware)	219	78.5	230	73.9	4.6	164	78	268	76.5	1.6

Indicator	Male Headed Household		Female Headed Household		Diff	CT-OVC		OP-CT		Diff
	N	%	N	%		N	%	N	%	
Visited by agent promoting solar devices (All households)	273	24.9	313	24.3	0.6	203	33	363	20.4	12.6***
Households that have discussed solar systems (All households)	273	16.8	313	17.3	-0.4	203	22.2	363	13.8	8.4**
Household would like to buy a solar device (Households which do not have a solar device)	258	66.7	292	65.4	1.3	196	70.9	334	63.2	7.7*

Table 34 Education (Member level indicators)

Indicator	Overall		Kilifi		Garissa		Diff
	N	%	N	%	N	%	
Currently attending school (aged 6-15)	1736	92.7	1178	96.6	558	84.6	12.0***
Regularly attending school (aged 6-15)	1736	89.2	1178	91.9	558	83.5	8.4***
Child promoted to the next grade (aged 6-15)	1554	88	1113	84.6	441	96.4	-11.7***
Currently attending school (aged 3-18)	2399	82.6	1677	86	722	74.5	11.5***
Regularly attending school (aged 3-18)	2399	79.2	1677	81.5	722	73.7	7.8***
Child promoted to the next grade (aged 3-18)	1855	86	1366	82.7	489	95.3	-12.6***

Indicator	Male Household Members		Female Household Members		Diff	CT-OVC		OP-CT		Diff
	N	%	N	%		N	%	N	%	
Currently attending school (aged 6-15)	906	93.2	830	92.3	0.9	554	93.9	1110	92.4	1.4
Regularly attending school (aged 6-15)	906	89.1	830	89.4	-0.3	554	88.3	1110	89.7	-1.5
Child promoted to the next grade (aged 6-15)	811	88.5	743	87.3	1.2	502	86.9	995	88.4	-1.6
Currently attending school (aged 3-18)	1245	83.6	1154	81.5	2.2*	757	83.5	1544	82.3	1.2
Regularly attending school (aged 3-18)	1245	79.6	1154	78.7	0.9	757	77.7	1544	79.8	-2.1
Child promoted to the next grade (aged 3-18)	975	86.8	880	85.1	1.7	591	85.6	1193	86.2	-0.6

Table 35 Child Time Use (Household level indicators)

Indicator	Overall		Kilifi		Garissa		Diff
	N	%	N	%	N	%	
Number of hours spent going to school	580	8.2	371	8.8	209	7.1	1.8
Number of hours spent studying outside school	580	0.8	371	0.9	209	0.7	0.2
Number of hours spent studying at home in daylight	580	0.2	371	0.2	209	0.2	0
Number of hours spent studying at home during darkness	580	0.6	371	0.7	209	0.5	0.2
Child does homework outside school	580	73.1	371	68.2	209	81.8	-13.6
Number of hours spent on leisure activities	580	1.6	371	1.9	209	1.1	0.8
Number of hours spent on chores	580	0.7	371	1.1	209	0.1	1
Number of hours spent sleeping	580	9.4	371	9.1	209	9.9	-0.8
Number of hours spent on other activities	580	2.3	371	2.1	209	2.6	-0.4
Number of hours spent studying (school & homework)	580	9	371	9.7	209	7.8	1.9
Number of hours spent going to duksi/madrassa/other religious education	580	1	371	0	209	2.6	-2.5

Indicator	Male Household Members		Female Household Members		Diff	Children in Lower Primary		Children in Upper Primary		Diff
	N	%	N	%		N	%	N	%	
Number of hours spent going to school	311	8	269	8.4	-0.3	424	7.8	156	9.3	-1.5
Number of hours spent studying outside school	311	0.9	269	0.8	0	424	0.8	156	0.9	-0.1
Number of hours spent studying at home in daylight	311	0.2	269	0.1	0	424	0.2	156	0.1	0.1
Number of hours spent studying at home during darkness	311	0.6	269	0.7	0	424	0.6	156	0.8	-0.2
Child does homework outside school	311	72	269	74.3	-2.3	424	69.8	156	82.1	-12.2
Number of hours spent on leisure activities	311	1.8	269	1.5	0.3	424	1.9	156	0.8	1.1
Number of hours spent on chores	311	0.7	269	0.8	-0.1	424	0.8	156	0.4	0.4
Number of hours spent sleeping	311	9.4	269	9.3	0.1	424	9.4	156	9.2	0.2
Number of hours spent on other activities	311	2.3	269	2.3	0	424	2.3	156	2.4	-0.1
Number of hours spent studying (school & homework)	311	8.9	269	9.2	-0.3	424	8.6	156	10.2	-1.6
Number of hours spent going to duksi/madrassa/other religious education	311	0.9	269	1	0	424	0.9	156	1	0

Table 36 Health (Member level indicators)

Indicator	Overall		Kilifi		Garissa		Diff
	N	%	N	%	N	%	
Symptoms of ARI in the last two weeks	4337	5.4	3133	6.6	1204	2.2	4.4***
Experienced eye irritation due to smoke in last one month	4347	8.1	3137	9	1210	5.9	3.1***
School child experienced eye irritation due to smoke in last one month	1307	5.2	905	5.1	402	5.5	-0.4
Household member experienced a burn related to lighting fuel	4353	2.7	3146	1.4	1207	6	-4.6***

Indicator	Male Household Members		Female Household Members		Diff	Members aged 5 and younger		Members aged 6-15		Member aged 16 and older	
	N	%	N	%		N	%	N	%	N	%
Symptoms of ARI in the last two weeks	2007	4.8	2330	5.9	-1.0*	648	6.2	1726	3.1	1963	7.1
Experienced eye irritation due to smoke in last one month	2010	5.4	2337	10.4	-5.0***	653	3.2	1732	4.8	1962	12.6
School child experienced eye irritation due to smoke in last one month	686	5.4	621	5	0.4	1307	5.2	-	-	-	-
Household member experienced a burn related to lighting fuel	2012	2.8	2341	2.6	0.2	654	1.1	1729	2.8	1970	3.1

Table 37 Health (Household level indicators)

Indicator	Overall		Kilifi		Garissa		Diff	Male Head		Female Head		Diff
	N	%	N	%	N	%		N	%	N	%	
Cooking occurs outdoors or in separate building	586	78	373	65.7	213	99.5	-33.8	273	83.2	313	73.5	9.7
Household burns kerosene inside the home	586	56.1	373	88.2	213	0	88.2	273	53.1	313	58.8	-5.7
Cooking occurs indoors	586	57.2	373	68.1	213	38	30.1	273	57.9	313	56.5	1.3

Table 38 Livelihoods (Member level indicators)

Indicator	Overall		Kilifi		Garissa		Diff
	N	%	N	%	N	%	
Household member is working [All members 15 and above]	2112	73.6	1587	83.9	525	42.5	41.4***
Activity: Unpaid domestic work	1554	46.1	1331	45.8	223	47.5	-1.7
Activity: Farming for own consumption	1554	26.7	1331	31.2	223	0	31.2***
Activity: Collecting water	1554	30.4	1331	35.5	223	0	35.5***
Activity: Collecting firewood or other fuel materials	1554	22.4	1331	26.1	223	0	26.1***

Indicator	Overall		Kilifi		Garissa		Diff
	N	%	N	%	N	%	
Activity: Herding/Livestock producer (for yourself/unpaid)	1554	1.4	1331	1.6	223	0	1.6***
Activity: Small scale business	1554	14.8	1331	14.4	223	17.5	-3.1
Activity: Labourers in Mining/ Construction/ Manufacturing/ Agriculture	1554	9.1	1331	10.5	223	0.9	9.6***
Types of work engaged in per working member [All working members]	1554	1.9	1331	2	223	1	1.0***
Household member is not working – in education [All members 15 and above]	558	27.1	256	33.2	302	21.9	11.3
Household member is not working – too old [All members 15 and above]	558	26.9	256	26.2	302	27.5	-1.3
Household member is not working – unable to find work [All members 15 and above]	558	21.7	256	7	302	34.1	-27.1
Household member is not working – unable to work [All members 15 and above]	558	21.7	256	28.5	302	15.9	12.6
Household members engaged in work during darkness [All working members]	1554	32	1331	29.4	223	48	-18.6***
Number of hours worked in the past week [All working members]	1554	49.2	1331	46.4	223	65.3	-18.9***
Number of hours worked per week using light [All members using artificial light]	498	13.1	391	12	107	17	-5.0***
Household member is part of saving scheme [All members 15 and above]	2112	12	1587	14.2	525	5.1	9.1***

Indicator	Male Household Members		Female Household Members		Diff	CT-OVC		OP-CT		Diff
	N	%	N	%		N	%	N	%	
Household member is working [All members 15 and above]	853	68.5	1259	77	-8.6***	580	71.7	1456	74.4	-2.7
Activity: Unpaid domestic work	584	14.4	970	65.2	-50.8***	416	45.4	1083	46.4	-0.9
Activity: Farming for own consumption	584	19.2	970	31.2	-12.1***	416	26.7	1083	27.1	-0.4
Activity: Collecting water	584	14.6	970	39.9	-25.3***	416	26.9	1083	31.4	-4.5**
Activity: Collecting firewood or other fuel materials	584	3.6	970	33.7	-30.1***	416	19.2	1083	23.8	-4.6**
Activity: Herding/Livestock producer (for yourself/unpaid)	584	3.1	970	0.3	2.8***	416	0.7	1083	1.6	-0.8*
Activity: Small scale business	584	16.8	970	13.6	3.2**	416	14.7	1083	15.1	-0.5
Activity: Labourers in Mining/ Construction/ Manufacturing/ Agriculture	584	18	970	3.8	14.2***	416	6.7	1083	10.1	-3.3***
Types of work engaged in per working member [All working members]	584	1.4	970	2.2	-0.8***	416	1.7	1083	2	-0.2***

Indicator	Male Household Members		Female Household Members		Diff	CT-OVC		OP-CT		Diff
	N	%	N	%		N	%	N	%	
Household member is not working – in education [All members 15 and above]	269	35.7	289	19	16.7	164	39	373	22.3	16.8
Household member is not working – too old [All members 15 and above]	269	20.8	289	32.5	-11.7	164	12.8	373	32.4	-19.6
Household member is not working – unable to find work [All members 15 and above]	269	21.6	289	21.8	-0.2	164	27.4	373	19	8.4
Household member is not working – unable to work [All members 15 and above]	269	19.3	289	23.9	-4.5	164	15.9	373	24.4	-8.5
Household members engaged in work during darkness [All working members]	584	6.7	970	47.3	-40.6***	416	36.5	1083	29.9	6.6***
Number of hours worked in the past week [All working members]	584	43.2	970	52.7	-9.5***	416	52.4	1083	47.9	4.5***
Number of hours worked per week using light [All members using artificial light]	39	8.7	459	13.5	-4.8***	152	13.8	324	12.8	1.0*
Household member is part of saving scheme [All members 15 and above]	853	5.2	1259	16.6	-11.4***	580	11.7	1456	12	-0.2

Table 39 Livelihoods (Household level indicators)

Indicator	Overall		Kilifi		Garissa		Diff
	N	%	N	%	N	%	
Total income generating activities per household [Households with income generating activities]	520	5.7	370	7.4	150	1.5	5.8
Number of income generating activities started in the last 12 months [Households with income generating activities]	520	1.5	370	1.6	150	1.5	0.1
Household monthly total income (KES)	586	3716.1	373	3983	213	3248.6	734.4
Household monthly income excluding remittances (KES)	571	2966.9	370	3458.4	201	2062.2	1396.2
Proportion of activities conducted at home [Households with income generating activities]	520	39	370	34.3	150	50.5	-16.2

Indicator	Male Headed Household		Female Headed Household		Diff	CT-OVC		OP-CT		Diff
	N	%	N	%		N	%	N	%	
Total income generating activities per household [Households with income generating activities]	256	5.9	264	5.4	0.5	182	4	320	6.7	-2.7
Number of income generating activities started in the last 12 months [Households with income generating activities]	256	1.6	264	1.5	0.2	182	1.6	320	1.5	0.1
Household monthly total income (KES)	273	3651.3	313	3772.6	-121.3	203	4116.9	363	3497.9	619

Indicator	Male Headed Household		Female Headed Household		Diff	CT-OVC		OP-CT		Diff
	N	%	N	%		N	%	N	%	
Household monthly income excluding remittances (KES)	266	2860.5	305	3059.7	-199.2	195	3520.4	357	2697	823.5
Proportion of activities conducted at home [Households with income generating activities]	256	38.7	264	39.2	-0.5	182	37.4	320	40.1	-2.7

Table 40 Women's Time Use (Household level indicators)

Indicator	Overall		Kilifi		Garissa		Diff
	N	%	N	%	N	%	
Number of hours spent on productive activities	556	9.2	359	9.8	197	8.1	1.7
Number of hours spent on paid labour	556	1.2	359	1.2	197	1.1	0.1
Number of hours spent on unpaid labour	556	6.8	359	7.5	197	5.5	2
Number of hours spent on leisure activities	556	4.7	359	4.2	197	5.8	-1.6
Woman is time poor	556	23.9	359	29	197	14.7	14.2

Indicator	Women aged 16-20		Women aged 21 and older		Diff	Woman is the household head		Woman is the spouse		Woman is another household member	
	N	%	N	%		N	%	N	%	N	%
Number of hours spent on productive activities	108	9.6	448	9.1	0.5	127	9	92	10	337	9.1
Number of hours spent on paid labour	108	1.2	448	1.2	0	127	1.5	92	1.3	337	1
Number of hours spent on unpaid labour	108	7.1	448	6.7	0.4	127	6.1	92	7.1	337	7
Number of hours spent on leisure activities	108	4.6	448	4.8	-0.2	127	5.1	92	4	337	4.8
Woman is time poor	108	24.1	448	23.9	0.2	127	23.6	92	23.9	337	24

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